Signature 1000H+ Cable Analyzer User's Guide

Version 3.0
Major Revision
7 September, 1999

An ISO 9001 Certified Company

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1991 Parkway Boulevard
Salt Lake City, Utah 84119-2026
United States of America

Visit our web site at www.cirris.com

I Need Your Help!

As Senior Editor, it's my responsibility to constantly improve the manuals and other documentation we include with our equipment. We try hard, but we know we'll never please everyone. If you were in my chair, how would you change the documentation to make it better? Here's your chance to take gripes, suggestions and (we hope) praise directly to the guy who can change things. Please fax or mail this form to me, or contact me by e-mail.

Thanks!

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1000H+ User's Guide

Attach more pages if needed

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Table of Contents

Introduction to the Cirris 1000H+

Lets get started!

The Cirris 1000H+ cable analyzer is an easy-to-use machine that will allow you to test cables quickly, and with little fuss. In simple terms, the process of using your 1000H+ goes like this:

1. Install any expansion boxes you want to use (see page 10 for details). Once you have installed the boxes the first time, you probably won't have to do this again.

2. Install connector adapters to match the cables you want to test (see page 9 for details).

3. Check the test option settings; reset the options if you need to (see page 17 for details).

4. Either:

    - Learn a Sample Cable (a cable you know is built correctly) of the kind you want to test (see page 23 for details), or...

    - Retrieve the wirelist data for the kind of cable you want to test from the analyzer's memory (see page 31 for details)

This completes programming the analyzer for testing cables. If you have connected a Sample Cable to learn it, disconnect it now.

5. Connect the first cable you want to test.

6. Test the cable (see page 27 for details).

7. Record and/or or print the test results (see page 30 for details).

That's it! We'll show you how to do each of these steps in this manual.

What your order should contain

Your order should contain these things in addition to this manual:

- 1000H+ main unit, including a wall transformer with cord, to provide power for the analyzer.

- Hand-held test probe.

- Whatever connector adapters you have ordered (usually shipped in a 3 x 5-inch card file). You may also have ordered an optional tilt stand, or an optional frame stand. If so, these should be included.

- Any expansion boxes you have ordered.

Section 1: Work With the Hardware

The Cirris 1000H+ system consists of a main unit, and as many as three expansion boxes. To connect the cables you want to test to the analyzer, you use connector adapters which match the connectors on the cable you want to test.

In this section, we will explain how to work with the hardware. We will show you how to install your connector adapters, how to install an expansion box, and how to disassemble the analyzer in case you need to replace one of its subassemblies, or its EPROM.

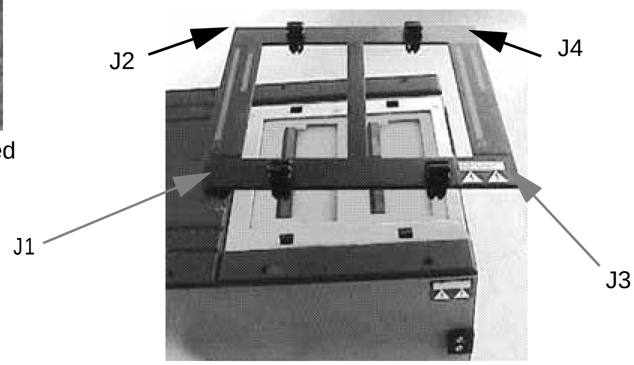
How to install connector adapters

To install connector adapters onto the Cirris 1000H+, follow these steps:

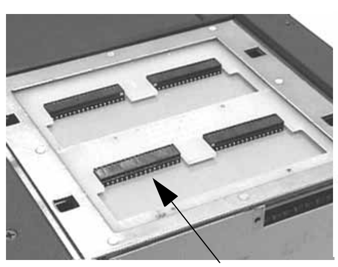
1. Turn the four twistlock fasteners on the adapter cover plate to unlock them, and remove the cover plate.

Twistlock fastener locked

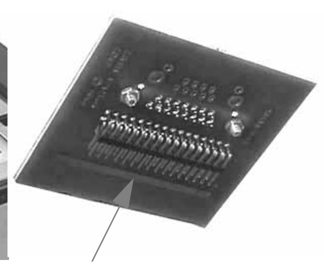
Twistlock fastener unlocked



2. Plug in the connector adapters. Be sure the pins on the bottom of each adapter are lined up properly, so they don't bend as they are inserted into the sockets. To line the pins up properly, press the adapter against the inside edge of the metal frame, and have the bottom of the adapter card resting on the plastic adapter support.

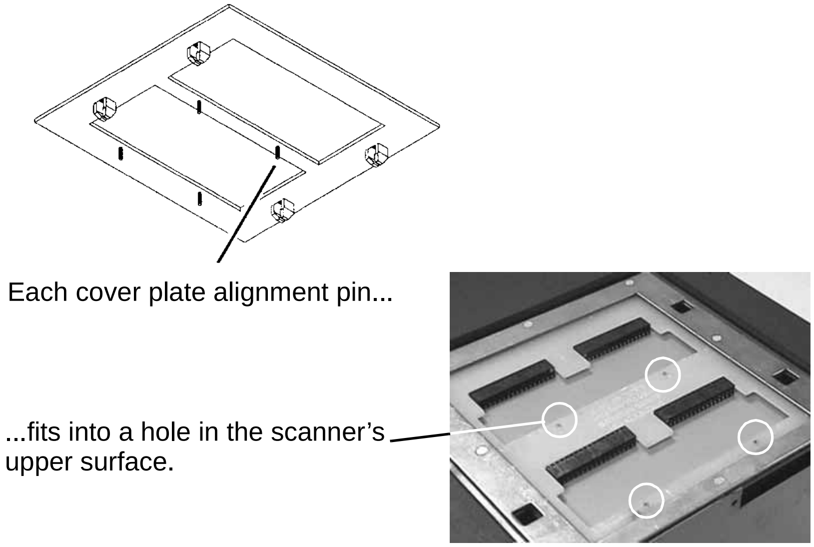


These horizontal pin sockets...



accept the adapter connector pins on the bottom of each adapter

3. Replace the cover plate, making sure the small alignment pins on its underside fit into the corresponding holes on the scanner's upper surface.



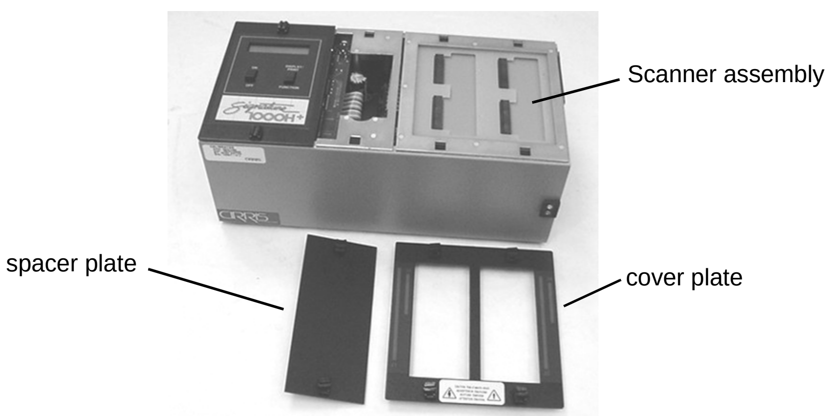
4. Lock the twistlock fasteners to hold the adapters firmly in place.

How to install an expansion box

Up to three expansion boxes can be installed on your 1000H+ to increase the number of test points available. You can set up your system to have as many as 512 test points.

To install an expansion box, follow these steps:

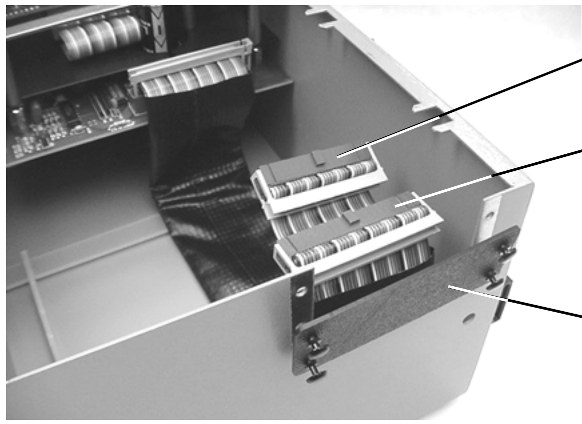
1. Unlock the twistlock fasteners on the top of the analyzer's spacer and cover plates, and on the top of the expansion box. Remove the cover plate and the spacer plate.

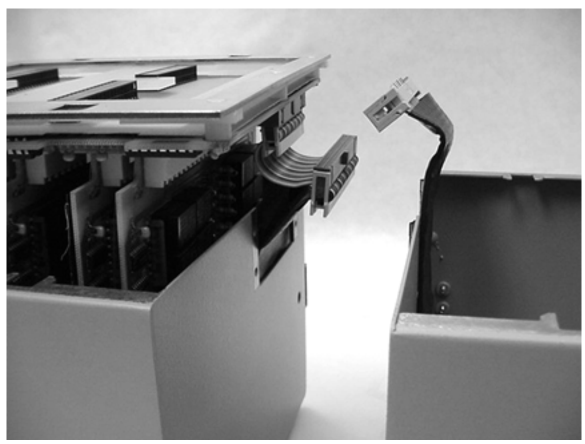


2. Lift the scanner assemblies out of both the main unit and the expansion box. (**Note**: Your expansion box may have a black plastic plate covering the opening where you will be routing the scanner cable. Once the scanner has been removed, push the plastic rivits out from the inside of the chassis, and remove the plastic plate.)

    - For photographic clarity in the top photo, we've removed the scanner

assembly from the main unit, and disconnected it. You see the connector that plugs into the main unit's scanner assembly, and the connector that plugs into the scanner assembly in the expansion box. You also see the plastic plate in the main unit's cable routing opening partially removed. You should remove the plate completely. Make sure the connections to both the main unit's scanner and the scanner in the expansion box are secure.

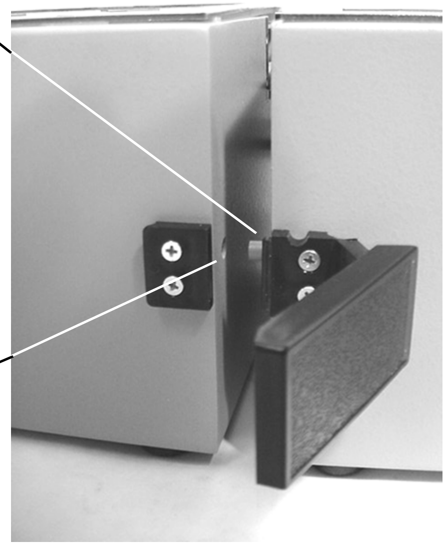




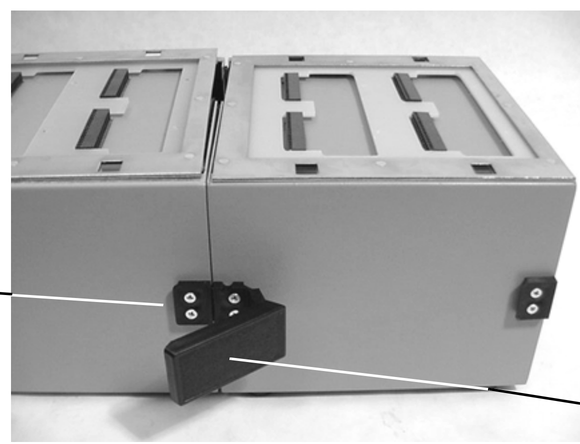
This view shows the cables that connect the main unit to the expansion box as they should appear just before you plug them together. Be sure the connectors are well-seated, and that the connection is secure.

Gently lower both scanners into their boxes, routing the connecting cables through the openings in the side of each box.

3. Slide the two metal boxes together. The alignment pins in the side of one box should fit into the round openings in the side of the next box.

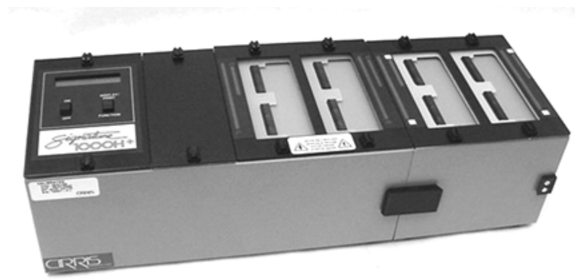


4. Once the two boxes are in position, hook the drawlatches on one box over the keepers on the other box, then close the drawlatches to lock the boxes securely together.



Once the boxes are together (aligned by the alignment pins and holes) hook the drawlatches over the keepers on each side of the analyzer, then snap the drawlatches shut. Replace the coverplates.

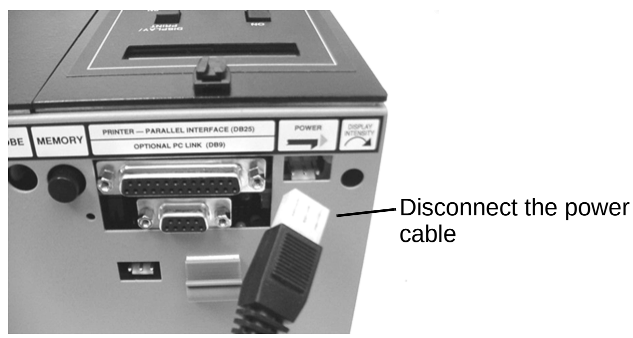
5. This photo shows your 1000H+ as it should look with one expansion box installed, and the spacer plate and coverplates in place..



How to change the EPROM

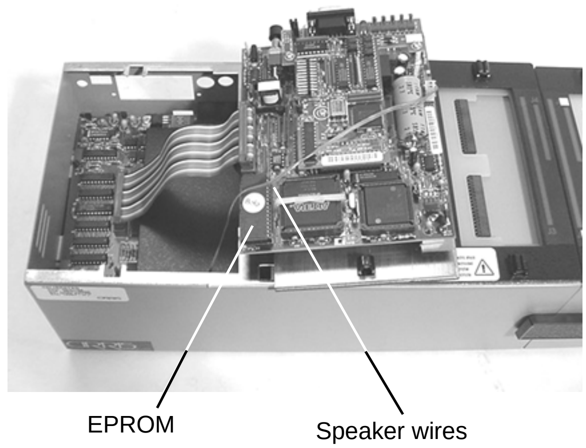
You may need to change the EPROM on the microprocessor assembly. To do this, follow these steps:

1. Disconnect the wall transformer from the wall outlet, then disconnect the power cable from the socket on the back of the analyzer.

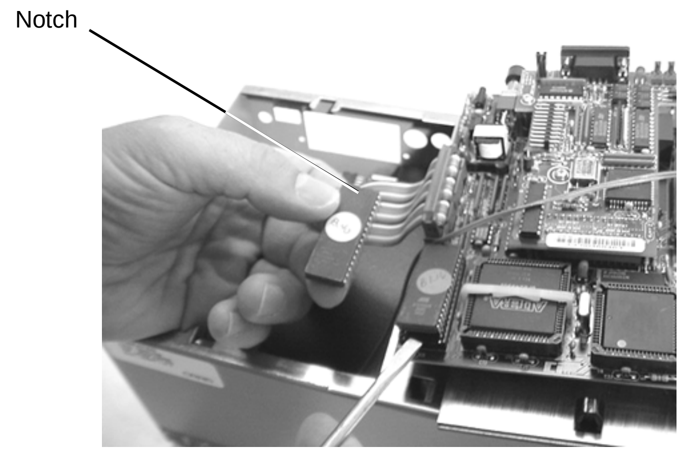


2. Unlock the twistlock fasteners, remove the spacer plate, then gently raise the microprocessor assembly out of the box.

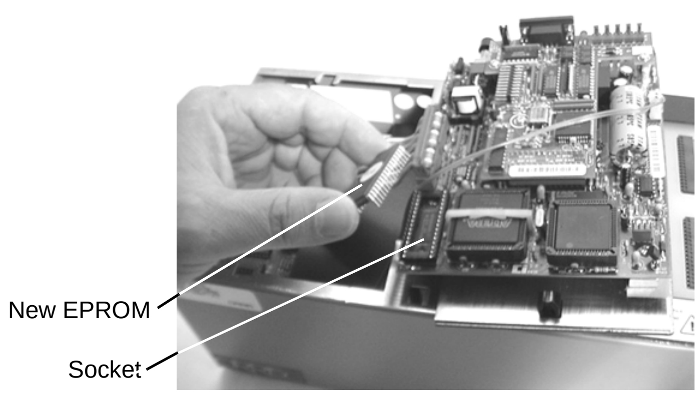
3. Carefully turn over the microprocessor assembly. You'll now be able to see the EPROM you are about to change, with the speaker wires lying close by.



4. Using a small, flat-bladed screwdriver, gently pry the EPROM out of its socket, and remove it.

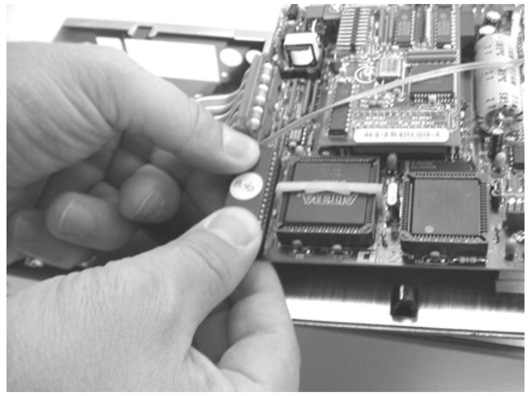


5. Gently align the pins on the new EPROM with the holes in the socket.



Gently place the new EPROM on the socket, and align the pins. Be careful not to bend the pins!

6. Carefully push the new EPROM down into the socket using even pressure. Be careful not to misalign or bend the pins!.

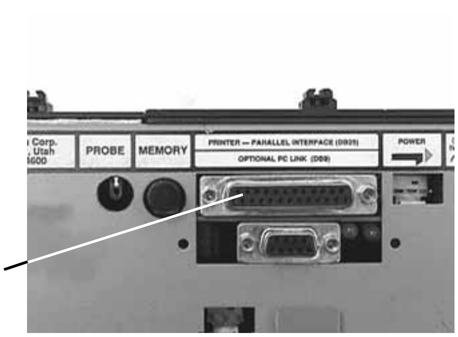


7. Gently lower the microprocessor assembly back into the box. Replace the spacer plate, then lock the twistlock fasteners. Your unit is reassembled!

Adding a printer

The 1000H+ works with almost any printer that has an Epson/Centronics parallel interface. **WARNING!!** Connecting the analyzer to a printer with an RS-232 serial interface will cause serious damage to the analyer, and is not covered by your factory warranty.

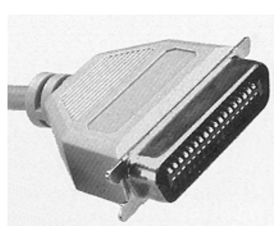
To connect the printer, use a standard Epson/Centronic parallel interface cable, readily available from almost any PC dealer. Plug one end of the cable into the printer, and the other end into the analyzer's parallel printer socket as shown in the photo.



Plug the printer in here

How do I know if I have a parallel printer?

To see if you have a parallel printer, look for the parallel connector on the printer. Printers usually have a parallel interface located in back. Many printers have both a serial and a parallel connector. To work with the 1000H+ your printer must have a 36-position female ribbon connector similar to the one shown here.



Can I use one printer with more than one analyzer?

Yes. To use your printer with more than one analyzer, use a switchbox. To change which analyzer the printer is receiving information from, simply change the switch setting on the box.

How do I use a printer without an on-line/off-line switch?

If your printer does not happen to have an on-line/off-line switch, you can use either of two solutions:

- Add a switch by placing a switch in the wire to pin 11 of the Epson/Centronics printer cable. When pin 11 on either side of the cable is open, the analyzer will see the printer as being off-line, and will display information rather than send it to the printer. When you close the switch so that pin 11 is closed, information will be sent to the printer.
- If you have a switch box available, you can connect the cable to the switchbox, and use its switch as the on-line/off-line switch.

Changing the company name

To change the company name that appears in the documentation produced by the 1000H+, you can order an EPROM change from Cirris Systems. Replace the EPROM. For details on how to do this, see page 13.

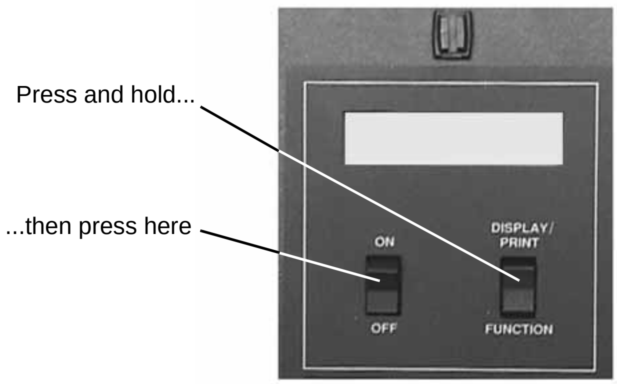
Section 2: Check the Option Settings

Overview: The Cirris 1000H+ has twelve test options. Before we learn a Sample Cable, we'll make sure they are set to their factory defaults.

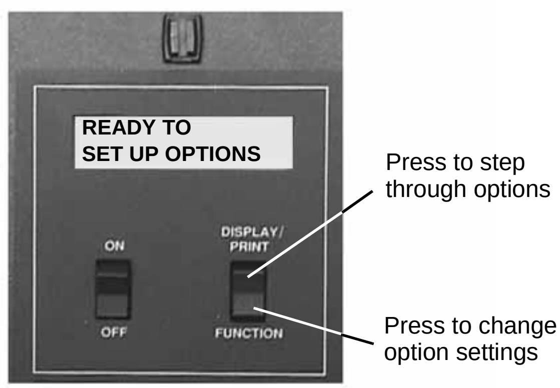
How to check the option settings

To check the option settings, do these things:

1. Press in and hold the Display/Print switch as you turn on the analyzer by pressing the On switch. Hold Display/Print until **Ready To Set Up Options** appears.



2. Once **Ready To Set Up Options** appears in the display, release Display/Print.



3. Select the **Create Test From** option by pressing Display/Print.

   • If the setting is **SAMPLE CABLE**, go on to the next option by pressing Display/Print

   • To change the option setting, press Function until **SAMPLE CABLE** appears, then go on to the next option by pressing Display/Print.

4. Continue stepping through the options by pressing Display/Print, changing the settings as necessary by pressing Function, until all the options are set as shown in this table: When you are done, **Ready to Learn** will appear on the display.

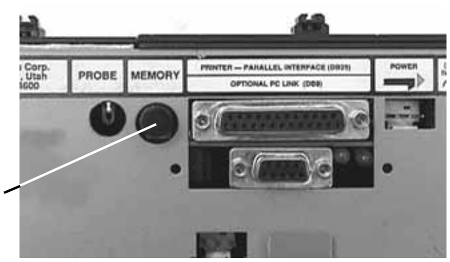
Factory Default Option Settings	
Option	**Setting**
Create Test From	SAMPLE CABLE
Connection Resistance	AUTO
Hipot Voltage	300 V
Insulation Resistance	10 MΩ
Hipot Duration	100mS
Apply Hipot to	ALL ADAPTER PINS
Single Net Error	FAILS HIPOT
Auto Hipot	OFF
Error Tones are	LOW
Sorted Wire List is	OFF
Count All Cables is	OFF
Auto Print is	OFF

What to do if you go past the value you want

If you want to go backward through either the options or settings, press in and hold the Memory button on the back of the analyzer, while pressing Display/Print or Function. **Note**: All options or settings will roll over to the beginning when you are going forward or backward.

.

Memory button



Your option settings are saved

When you set the value you want, it is saved once it is displayed on the screen.Turn off the analyzer, the analyzer will use those settings when you power it up again.

Section 3: What the Option Settings Mean

Overview

The Cirris 1000H+ has twelve test option settings which you set to meet your testing requirements. In this section, we'll tell you what each of the settings means.

Create Test From

Gives you the option to create a new test setup from a new Sample Cable, your last test setup, or by learning a complex cable that contains resistors and/or diodes in addition to ordinary wire connections.

SAMPLE CABLE: Use this setting to learn standard simple cables (cables that contain only wires and connectors).

LAST TEST SETUP: Use this setting when you need to use the same test setup each time you turn on the analyzer. Useful when testing large batches of the same type cable. Will help protect your test setup from a power failure, or if you accidentally turn on the analyzer with an untested cable connected.

COMPLEX ASSEMBLY: Use this setting to learn a cable that contains resistors, diodes, or divider networks in addition to ordinary wires and connectors. When you use this setting, the Connection Resistance refers to the resistance level that definitely separates wires from resistors. The analyzer sets this to 5 Ω. You may change the setting to meet your needs. Using the Connection Resistance CALC mode may help you determine a good setting.

Connection Resistance

Specifies the **maximum** resistance a connection can have and still be considered good. For example, if you set the Connection Resistance to 10 Ω, the analyzer will consider all connections with resistances less than 10 Ω as good, and those with resistances greater than 10 Ω as bad.

Range: 0.1 to 100 Ω, 500 Ω, 1MΩ, 5 MΩ, AUTO, CALC.

AUTO mode: When you set the Connection Resistance to AUTO, the 1000H+ measures the resistance of each connection in your Sample Cable, then automatically sets the Connection Resistance threshold to a value 20% higher than the largest resistance measured in the Sample Cable. The 20% margin of error is increased for resistances less than 1Ω.

CALC mode: Setting the Connection Resistance to CALC causes the 1000H+ to measure the resistance of the connections in the Sample Cable in the same way you would measure them with an ohmmeter. In this mode, the analyzer can only measure resistances up to 10KΩ. After the analyzer calculates the resistance of the Sample Cable, it prompts **RESISTANCE READY**. Press the Display/Print switch to display all resistances measured below 10Kohms.

Hipot Voltage

Specifies what voltage will be applied during hipot testing, between pins that should not be connected. This determines how effective the insulation on a cable is during a

test. The higher the voltage you set, the higher the insulation resistance the analyzer can detect. Voltage settings will affect the range of insulation resistance settings available to you. **Warning!!** Do not subject cable assemblies to voltages higher than they are designed to handle, because this may damage them. For example, ribbon cable is usually designed to handle up to 300 volts.

Insulation Resistance with hipot off

By setting the Insulation Resistance threshold, you select the highest resistance that the analyzer will detect during a test. For example, setting the Insulation Resistance at 50KΩ means the analyzer will detect connections with resistances up to 50KΩ. Any connections with resistances higher than 50KΩ will be ignored. **Important!** The Insulation Resistance setting must be equal to or greater than the Connection Resistance setting. When you select a hipot voltage, the resistance is the level at which a hipot failure will be detected.

This table shows how the Hipot Voltage setting limits what Insulation Resistance settings are available.

Hipot Voltage vs. Insulation Resistance Settings

Hipot Voltage	Available Range of Insulation Resistance Settings
OFF	From the Connection Resistance value you set to 100KΩ, then 500 KΩ, 1 MΩ, and 5MΩ.
50 V	5MΩ, 10MΩ, 20MΩ.
100 V	5MΩ, 10MΩ, 20MΩ, 50MΩ.
200 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ.
300 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ.
400 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ, 200MΩ.
500 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ, 200MΩ, 500MΩ.
630 V	5MΩ, 10MΩ, 20MΩ, 50MΩ, 100MΩ, 200MΩ, 500MΩ.
800 V	10MΩ, 20MΩ, 50MΩ, 100MΩ (200MΩ, 500 MΩ with special adapters).
1000V	10MΩ, 20MΩ, 50MΩ, 100MΩ (200MΩ, 500 MΩ with special adapters). **Note**: If you plug in an adapter not specially designed for 800 V or 1000 V, the analyzer will reset the Insulation Resistance value to 100MΩ.

Hipot Duration

This setting determines the length of time voltage will be applied to each **NET** during hipot testing. The longer the setting, the more likely the analyzer is to detect faults which occur over time (intermittents); but testing will take longer. **Important!** The system will not perform a hipot test until a cable has passed a conductance test. Once leakage above the set threshold is detected, the high voltage is switched off.

Apply Hipot To

This setting determines whether the hipot voltage will be applied to all adapter pins (whether they have connections or not), or only to those adapter pins that are connected to other pins. The available settings are ALL ADAPTER PINS, or

CONNECTIONS ONLY. The CONNECTIONS ONLY setting is generally faster, since only connected pins will be hipot tested.

Single Net Error

The range of settings for this option is IS IGNORED or FAILS HIPOT. This option allows cables with one oversized net, or a net with excessive capacitance (that would normally fail) to pass a hipot test. Most of the time, a cable which has insulation resistance problems will show two or more net failures, since they will be leaking to each other.

Caution! When Apply Hipot To is set to Connections Only, and Single Net Error is set to Ignored, the analyzer will not report an error if one net is leaking to any unconnected pin in the adapter.

Auto Hipot

This option lets you choose between automatic and manual hipot testing. When this option is ON, the analyzer will automatically begin a hipot test on a cable as soon as that cable passes a resistance test. You can repeat the hipot test by pressing the Function switch.

When this option is OFF, a cable won’t be hipot tested (after passing a resistance test) until you press the Function switch.The Function switch becomes a “push-to-test” switch on the hipot test.

Error Tones

When the analyzer detects errors, it emits a series of sharp beeps. This setting allows you to set the volume of these beeps. The available settings are Off, Low, and High.

Sorted Wire List

When this option is ON, it changes the order that errors appear in a net. For example, pin J1-01 will always come before pin J1-14 if they are connected in the same net. When this option is OFF, the order that pins appear in a net is determined by the scanning order of the analyzer.

Count All Cables

Once the analyzer is programmed, and you’ve begun testing cables, the analyzer begins to count the cables you test. When this option is ON, the printout from your tests shows the total number of cables tested, as well as the number of cables which tested as good. When this option is OFF, the printout will show only the number of cables that tested as good.

Auto Print

When a printer is connected to the analyzer and this option is ON, the system will print a one-line report when each cable being tested is disconnected, indicating whether that cable tested as good, bad, or intermittent. When this option is OFF, the system will not print each result automatically.

Section 4: Learn a Sample Cable, Store it in Memory

Overview:

In this chapter, we will show you how to learn a Sample Cable, then store the wirelist from that cable in one of the analyzer's permanent memory locations.

Memory in the 1000H+

The Signature 1000H+ has from 10 to 50 permanent memory locations you can store wirelists in. How many memory locations are available depends upon the size of the wirelists you want to save. Large wirelists take up more memory than small ones.You can store wirelists in these locations, retrieve wirelists from them, and delete wirelists from them. There is also one temporary memory location called "Last Learned."

Last Learned

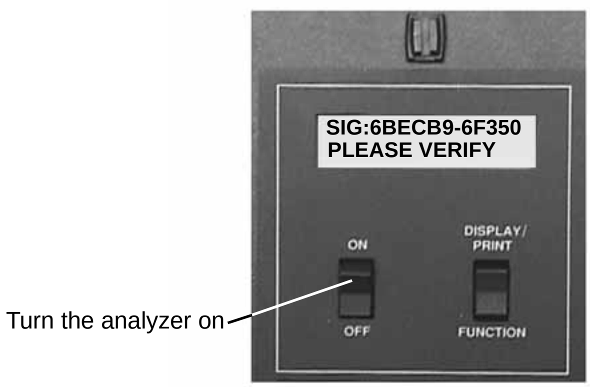
When the analyzer learns a new Sample Cable, the wirelist data from that cable is stored in the temporary "Last Learned" memory location. It stays there until you either save it in one of the permanent memory locations, or overwrite it by learning another Sample Cable.

Learn a Sample Cable

Before you can learn a Sample Cable, you must install the right cable adapters on your 1000H+ (see page 9 for instructions on how to do this).

To learn the Sample Cable do these things:

1. Connect the Sample Cable you want to learn to the connector adapters already installed on the 1000H+. Turn on the analyzer by pressing the On switch. The analyzer will learn the cable, then prompt **Please Verify**.



2. To verify that the Sample Cable has been learned correctly, press Display/Print.

   - If you have a printer connected to the analyzer, when you press Display/Print, the analyzer will print out the cable's wirelist information. The printout is your cable documentation. Compare the printed information to the Sample Cable's specification sheet or build list to be sure the cable is a good one.

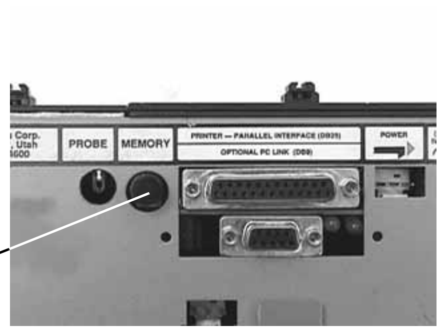
- If you don't have a printer connected to the analyzer, pressing Display/Print causes the analyzer to prompt wirelist information in its display. Repeatedly press Display/Print to step through the wirelist, transcribing the information to a blank documentation form (see page 79) as you go. Compare the transcribed information to the Sample Cable's specification sheet or build list to be sure it's a good cable.

3. Disconnect the Sample Cable from the analyzer.

Store the Sample Cable in memory

Now that you've learned the Sample Cable, and verified that the wirelist data is correct, you may store the cable in the analyzer's memory. To store the cable, do these things:

1. Press and hold in the Memory button (located on the back of the analyzer as shown in this photo).



Press and hold

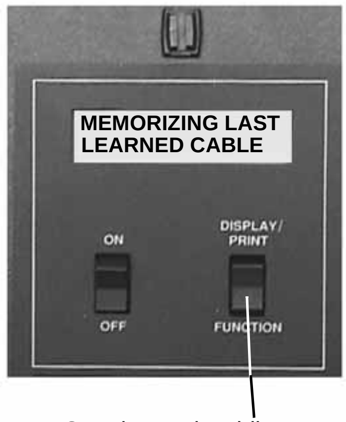
2. When you press the Memory button, the analyzer will prompt **Ready To Save Learned Cable**. Continue to hold the Memory button in for instructions 3 and 4.

Hold in the MEMORY button while you step by pressing here

3. While continuing to hold in the Memory button, press Display/Print to select a memory location. The analyzer will default to the first unused memory location. Each time you press Display/Print, the analyzer prompts the next unused memory location. For example, if location #1 is empty, the display will prompt **Mem-**

ory Location 1 Is Now Unused. Keep pressing Display/Print until you find the memory location you want. **Note**: If the display prompts **No Memory Available**, all of the analyzer's memory locations are full. You'll have to delete a wirelist to make room available. See "To delete a cable from the analyzer's memory, do these things:" on page 33 for instructions on how to do this.

4. When you have located an available memory position, continue holding the Memory button in, and press Function to save the newly-learned wirelist to that memory location. The display will prompt **Memorizing Last Learned Cable**.



Hold the MEMORY button in while you press here

5. Release the Memory button. The display will prompt **Last Learned Now Is In Location X**. The wirelist is now stored in the analyzer's memory.

What to do if you see an error message

If you get an error message such as **Learned Cable Resis Error** or **Insulation Resis < Auto.XXXX** while you're trying to learn a Sample Cable, check the following:

1. If the error message is **Learned Cable Resis Error**, the cable may have resistances that fall between the Connection Resistance and Insulation Resistance settings.

    - Press Display/Print to locate points with resistance errors, and document them. If the cable is correctly built, change the resistance settings

to accomodate the cable. See “To check the option settings, do these things:” on page 17 for details on how to do this.

- If the cable is not built correctly, use another Sample Cable that does not contain the errors, and repeat the learning process. **Note**: If you disconnect the cable with the error, or if you press the Memory button, the analyzer will enter the test mode.

2. If the error message is **Insulation Resis < Auto .XXXX**, check to see if the Connection Resistance is set to AUTO, and the Auto resistance is higher than the Insulation Resistance setting.

   - Change the Insulation Resistance setting to be equal to or higher than the AUTO Connection Resistance setting prompted in the display. See page 17 for details on how to change the setting.

Section 5: Test Your First Cable

How to test your first cable

Now that you have installed any expansion boxes you will be using, have installed your connector adapters, have checked the option settings, and have programmed the analyzer by learning a Sample Cable (see page 23), or by retrieving a cable from the analyzer's memory (see page 31), you are ready to test your first cable.

To test your first cable, follow these steps:

1. Disconnect and remove the Sample Cable from the analyzer.

2. Connect the cable you want to test to the analyzer.

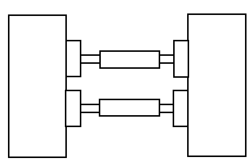
   - Once you have connected the cable, the analyzer will automatically begin the test. (**Note**: If you have set the Auto Hipot option to OFF, the analyzer will stop after the continuity and conductance tests, prompt **Ready To Hipot**, and wait for you to press Function to begin the hipot test.)

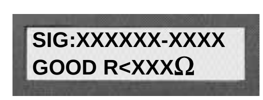
   - **WARNING!! Do not connect a powered ("live") cable to the analyzer!** This will seriously damage your analyzer, and will immediately void any stated or implied warranty.

Check the display, interpret the sounds

As the analyzer does cable tests, it will display results on its LCD display, and will emit sounds. Here's how to interpret what you see and hear:

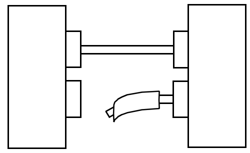
If a cable is good:
The display prompts the same alphanumeric signature as the Sample Cable. The display will show **Good R<X.XΩ**. The analyzer will emit a steady clicking sound.



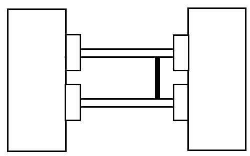


- To continue testing, disconnect the good cable, then replace it with another cable you want to test.

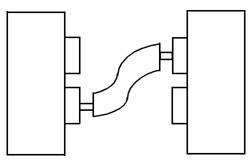
If a connection is missing:
The display prompts **Open Detected**, and the analyzer emits a series of single beeps.



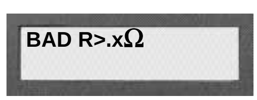
If the analyzer detects a short:
The display prompts **Short Detected**, and the analyzer emits a series of double beeps.



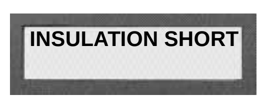
If both opens and shorts are detected:
The display prompts **Errors Detected**, and the analyzer emits a series of triple beeps.



If an insulation short is detected:
The display prompts either **Bad R> XΩ**s or **Insulation Short**. Both prompts indicate that the measured resistance is higher than the Connection Resistance setting, and lower than the Insulation Resistance setting. The analyzer emits a series of double beeps.



or



Interpreting hipot test results

If you have set the AUTO Hipot option to ON, the analyzer will automatically hipot test each cable after the cable passes the resistance tests. If this option has been set to OFF, the analyzer will prompt **Ready to Hipot**, and you will have to press Function to begin the hipot test.

Note: During the test, the analyzer prompts the net being hipot tested and **Hipot Test.** If you happen to touch any uninsulated part of the cable under test, you may experience a mild but annoying electrical shock, and cause the hipot test to fail.

Failed Hipot Test

If the hipot test detects errors, the analyzer prompts **Failed Hipot Test**. Press Display/Print to step through the errors detected. The display will prompt the problem nets as either **Has Leakage**, or as **Over Current**.

- **Has Leakage** indicates that there is weak insulation between pins or bare wires that nearly touch. These defects have the potential to become short circuits. At the most sensitive settings, contamination from fingerprints or body oils deposited while handling connectors may cause a cable to fail.

- **Over Current** indicates that the cable has excessive capacitance for the selected hipot voltage setting or if the resistance of the leak is sufficiently low (approximately 500 Kohms). If the cable has too much capacitance, try using a lower hipot voltage.

Dielectric Fail:

This indicates that the analyzer detected electrical arcing between nets during the hipot test. If the analyzer can isolate the nets that are arcing during the test, it will prompt them in the display. If it cannot isolate the specific nets that are arcing, it will prompt **Undetermined Net**.

Intermittent

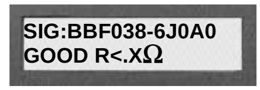
If a cable develops shorts or opens after it first tests as good, the display prompts an intermittent error. The analyzer emits a steady series of clicks as though the cable were good.

- Press Display/Print to show the error condition that existed when the intermittent occurred.

- Clear the intermittent by pressing the Memory button on the back of the analyzer.

Passed Hipot Test

If the hipot test is successful, the analyzer briefly prompts **Passed Hipot Test**, then cycles to a continuous resistance test and prompts **Good R<.XΩ**. The analyzer emits a steady clicking sound after each newly-completed continuity/conductance test. To repeat the hipot test, press Function again. The conductance test always follows a successful hipot test, and continues until you remove the cable.



Print or transcribe an error list

If the analyzer detects errors, it can prompt where the error is in a cable. To do this, press Display/Print while the cable is still connected to the analyzer. If you have a printer connected to your analyzer, it will automatically print out an error list. If you don't have a printer, keep pressing Display/Print to step through the errors as you transcribe them to a cable documentation form (see page 79).

Section 6: Retrieve a Cable from Memory

Why retrieve a cable?

Before the 1000H+ can test cables, it has to be programmed with wirelist data for the cables you intend to test. You can avoid having to re-learn a Sample Cable each time you want to test, by storing the learned information in the analyzer's memory (see page 24 for instructions on how to do this). Once the information is stored, all you have to do to set up for testing is to install the correct cable adapters on the analyzer, then retrieve the cable data from memory in order to program the analyzer.

How to retrieve a cable

To retrieve a learned cable's data from memory and program the analyzer for testing, do these things:

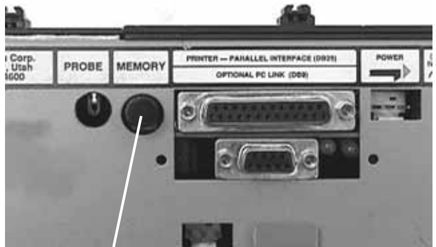
1. Install the connector adapters that mate with the cables you want to test (see page 9 for instructions on how to do this).

2. Hold in the Memory button as you turn on the analyzer. Continue holding in the Memory button as you do the next step. The analyzer will prompt **Ready To Access Memory Locations**.

Press and hold... ...as you turn the analyzer on

3. Continue holding in the Memory button while you press Display/Print to step through the Sample Cables stored in the analyzer's memory. The first time you press the switch the display prompts the signature of the cable in the "Last Learned" memory location. When you press Display/Print again, the analyzer

prompts the signature for the cable stored in permanent memory location number 1 (there can be as many as 50 of these). Continue pressing Display/Print until you see the signature for the kind of cable you want to test.



Continue to hold...

...while you step through the cable signatures

4. When the display prompts the signature for the kind of cable you want to test, release the Memory button.

   - If the display prompts **Ready To Test**, the analyzer has retrieved the Sample Cable data, the correct adapters are in place, and you are ready to test cables.

   - If the display prompts **JX Adapter Sig: Should Be**, this means that the adapters you have installed don't go with the Sample Cable you've retrieved. Read the display to get the correct adapters and their positions, then install them. **Note**: It's OK to install adapters without turning off the analyzer when it is in this mode. Once you've installed the correct adapters, the display will prompt **Ready To Test**.

Cable retrieved, adapters are correct. You are ready to test.

Installed adapters are not correct. Install correct adapters. When you've done that, prompt will change to **Ready to Test**.

Section 7: Delete a Cable from Memory

Why delete a cable?

The Cirris 1000H+ has a maximum of 50 permanent memory locations for storing cable information. How many locations are actually available depends on the size of the wirelists being stored. Small wirelists take up less space than large ones. You may need to delete cables to make room for new wirelists, or to discard wirelists you no longer use for testing.

How to delete a cable

To delete a cable from the analyzer's memory, do these things:

1. Hold in the Memory button as you turn on the analyzer. Continue holding in the button as you do the next step. The analyzer will prompt **Ready To Access Memory Locations**.

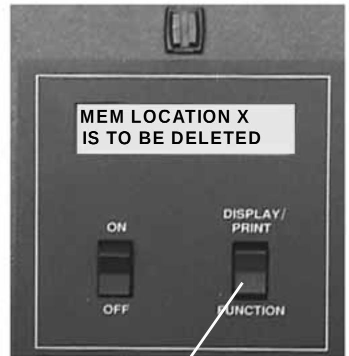
Press and hold...

...as you turn the analyzer on

2. Continue holding in the Memory button while you press Display/Print to step through the Sample Cables stored in the analyzer's memory, until you come to the signature of the cable you want to delete. (Remember, the first cable displayed will be the cable in the "Last Learned" memory location. It cannot be deleted.) When you come to the cable you want to delete, the display should prompt **Mem. Location X Sig: XXXXXX-XXXX**, indicating the memory location and signature of the cable.

Continue to hold...

3. Continue to hold in the Memory button while you press Function to select the cable for deletion. Continue to hold down the Function switch as you do the next step.



Continue to hold...

...while you press here to select the cable for deletion

4. Delete the Sample Cable you've selected by first releasing the Memory button, then releasing the Function switch. When you release the Memory button, the prompt will change to **Mem Location X Is Now Unused**. When you release the Function switch, the prompt will change to **Ready To Learn**. The memory location is now empty.

First release this button...

...then release this button

Section 8: Print a Directory of Cables Stored in Memory

Overview

If you have a printer connected to your 1000H+, you can print a directory that shows all the Sample Cables stored in the analyzer's memory. The directory will show the memory location number, and the signature of the Sample Cable stored in each memory location. **Important Note!**: For photographic clarity, we've removed the printer cable in the views shown here. For your printer to work, it <u>must</u> be connected to the analyzer.

Print out a directory

To print out a directory of the Sample Cables stored in the analyzer's memory, do these things:

1. Make sure the printer is properly connected to the analyzer, and is turned on.

2. Press and hold in the Memory button as you turn on the analyzer. Continue to hold in the Memory button as you do the next step.

Press and hold this button...
(**Note**: Printer cable is not shown)

...as you turn the analyzer on

3. As you continue to hold in the Memory button, press Display/Print once. This causes the display to prompt **Press Function To Print Dir**.

Continue to hold this button in...
(**Note**: Printer cable is not shown)

...as you press here

4. When the display prompts **Press Function To Print Dir**, press the Function switch. If your printer is properly connected to the analyzer, turned on, and on-line (selected), it will print a directory showing the signatures of all the cables stored in memory, and their corresponding location numbers.

Press here to print a directory

5. Release the Memory button.

Section 9: Cable Documentation and Signatures

What is cable documentation?

Cable documentation is a printed record of a Sample Cable's unique signature, the adapters used to test it, and the test parameters used to test it. It also contains a complete list of the interconnections in the cable, and any notes necessary to help you build the cable.

Why prepare cable documentation?

When you prepare complete documentation, you prepare a standard set of information from which future cables will be built. The 1000H+ can help you prepare documentation by learning a Sample Cable. Once the cable has been learned, you can either transcribe it by hand onto a documentation form (see page 79), or print it out if you have a printer connected to your analyzer.

Once the cable has been completely documented and stored in memory, you won't need to keep an array of "known good" cables handy for comparison. If the signature prompted by the analyzer after each test matches the signature in the cable's documentation, you can be sure the cable is correctly built according to your specifications.

You can store Sample Cable information in the analyzer's memory. When you retrieve that information from memory, you program the analyzer just as if you'd learned a real Sample Cable. The analyzer will prompt the Sample Cable's alphanumeric signature, and which connector adapters to install. See page 24 for information on how to store a Sample Cable in memory, and page 31 for information on how to retrieve a cable from memory.

Please see next page...

How to interpret cable documentation

The documentation your 1000H+ produces contains all the information you will need to precisely duplicate test setups. This example shows a typical wirelist with the cable signature, parameter signature, adapter signatures, and resistance settings.

```
     SIGNATURE 1000h+ CABLE DOCUMENTATION                              B.40 — M

                                                                   B         E
A — CABLE SIGNATURE: BBF038            CABLE PART NO.:_________________
C — PARAMETER SIGNATURE: KX8NJ
D — J1 ADAPTER SIGNATURE: 03FAC1       CONNECTOR DESCRIPTION:________
    J2 ADAPTER SIGNATURE: F5B4E0       CONNECTOR DESCRIPTION:_______
F — CABLE DESCRIPTION

    PARAMETER SETTINGS:
    CONNECTION RESISTANCE                AUTO < .5 OHM
    HIPOT VOLTAGE                        300 V
G   INSULATION RESISTANCE                >50 M ohm
    DURATION PER NET                     100 mS
    APPLY HIPOT TO                       ALL ADAPTER PINS
    SINGLE NET ERROR                     WILL FAIL HIPOT — N

    WIRE LIST:
    NO. COMMON CONNECTIONS
H — 1  J1-01 J2-01
    2  J1-02 J2-03
I — 3  J1-03 J2-02
    4  J1-04 J2-04 J2-20

J — TOTAL CABLES TESTED: 50                                   K
    INTERMITTENT CABLES TESTED: 6
    GOOD CABLES TESTED:  40                     DATE:_______________
    ________________________________________________________________
L — NOTES:
```

A. This example shows a cable with the cable signature BBF038. Both this signature and the five-digit parameter signature (see item C below) must match those prompted in the display when you are preparing to test cables.

B. This blank area is left so you can write in the cable's part number.

C. This is the five-digit parameter signature that represents the voltage and resistance settings you have selected for testing the cable. This signature must match the one shown in the analyzer's display for the resistance and voltage levels to be the same.

D. These are the connector adapter signatures. In this example, the signature for the adapter in position J1 should be 03FAC1. The signature for the adapter in position J2 should be F5B4E0.

E. This blank area is for writing a brief description of the connector adapters.

F. This blank section is for writing a cable description.

G. This section shows the test parameters. Our example shows that the Connection Resistance is set on AUTO, and that the Insulation Resistance High Voltage option is set to 50 MΩ.

H. Each net (each group of interconnected pins) is identified by a *net number*. The net numbers appear directly under the number heading NO, and are immediately followed by the connected points that comprise that net.

I. The interconnections that comprise each net appear after each net number, and are shown directly under the heading COMMON CONNECTIONS. The numbers J1, J2,

J3, and J4 indicate the adapter position. The number after the hyphen is the specific pin to which a connection is made
J. Our example shows that a total of 50 cables has been tested. Forty of these tested as good. Six cables tested as having intermittent errors, and four tested simply as bad. This breakdown of good and bad cables appears on the documentation because the analyzer's Count All Cables option was set to ON. When this option is set to OFF, the printout shows only the number of cables which tested as good.

K. This blank area is for writing in the date of the test.

L. This is a section left open for writing in any additional notes. You may wish to include a drawing of the cable here.

M. This shows the EPROM revision number your analyzer is equipped with.

N. "Will Fail Hipot" may or may not appear in the printout depending on what settings you are using.

How signatures work

Signatures are the working basis of the 1000H+ system. When the 1000H+ learns a Sample Cable (a cable that you know is built correctly), it computes and displays a cable signature for that Sample Cable. This signature becomes part of your cable documentation for that kind of cable.

- When the signature prompted by the analyzer matches the signature in your cable documentation, you know that your test setup is correct.
- When the signature of a cable you are testing matches the documented signature during a test, you know the cable under test is correctly built.

Types of signatures

The 1000H+ uses three types of signatures:

1. The *cable* signature.
2. The *parameter* signature.
3. The *connector adapter* signature(s).

The cable signature

The first six characters in a signature (as displayed by the 1000H+) are called the *cable* signature. This six-character alphanumeric number represents a summary of the interconnections in a cable. When the analyzer learns a cable, it computes this unique signature based on the cable's interconnections, and the connector adapters in use.

The parameter signature

When the 1000H+ displays a signature, it first displays the six-digit cable signature, then a hyphen. The five-digit alphanumeric number that follows the hyphen is the *parameter* signature. It represents the voltage and resistance settings you have selected. **Note**: If you select the same voltage and resistance settings for two different kinds of cables, both kinds will have the same parameter signature, but different cable signatures.

The connector adapter signature(s)

The connector adapters you use to connect your cables to the 1000H+ have unique,

six-character *connector adapter* signatures. Each kind of adapter has its own adapter signature. These signatures help you verify that your test setups are correctly done. They appear on the labels attached to the adapters, and on your cable documentation (see item D on page 39). When the adapter signatures match those found on your cable documentation, you have installed the correct adapters.

How connector adapters are supported

The 1000H+ uses connector adapters mounted on small printed circuit boards to connect the cables you want to test to the analyzer's scanner assembly. Cirris Systems can provide adapters for nearly all popular connectors. You can also make an exterior adapter cable to adapt to any connector with up to 120 pins by using an optional frame mount stand. This photo shows a frame stand with D-sub type connectors.

Types of adapters

There are three general adapter types available for the 1000H+. These are:

1. *Single-high* adapters. These are for connectors with up to 28 pins. They occupy one "J" position on the analyzer's scanner.

Example: An ADBP-15 single-high adapter

Single-high adapter mounted in scanner position J1.

2. *Double-high* adapters. These are for connectors with from 29 to 64 pins. They occupy two "J" positions on the analyzer's scanner.

Example: ADPG-37 double-high adapter

Double-high adapter mounted in scanner postions J1, J2

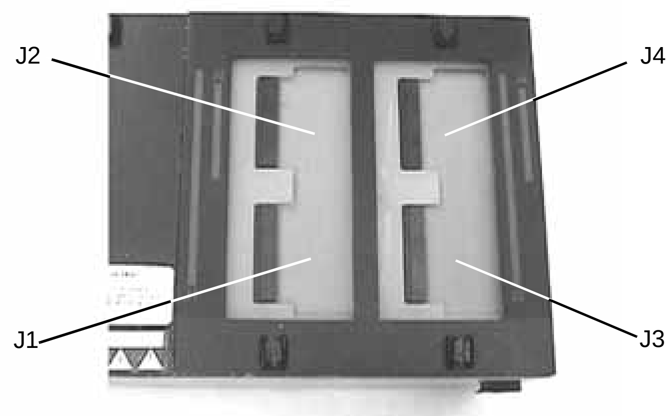
3. *Quad-high adapters*. These are for connectors with up to 120 pins. They occupy four “J” positions on the analyzer’s scanner. To use more than one of these at one time, you <u>must</u> use an expansion box.

Example: AD5P-100A quad-high adapter

Quad-high adapter mounted in scanner positions J1, J2, J3, J4

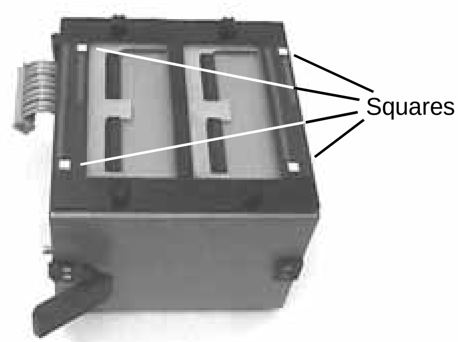
How connector adapters are placed on the analyzer

The 1000H+ analyzer itself has four connector adapter positions on its scanner assembly, marked J1 through J4. Each position has 32 points, for a total of 128 available points.



How connector adapters are placed on expansion boxes

Each expansion box has four connector adapter positions on its scanner assembly. These positions are not marked. They each have a white square on which you may write in the adapter position number. The analyzer recognizes the positions for the first expansion box as J5 through J8, for the second expansion box as J9 through J12, and for the third expansion box as J13 through J16. You can connect up to three expansion boxes to the analyzer’s main box, for a total of 16 connector adapter positions (512 available test points).



Expansion box with white squares at all four adapter positions

1000H+ with 1 expansion box installed. Eight “J” positions (256 test points) are available.

Order of adapter positions

In your cable documentation, connector adapter positions appear in sequential order beginning with J1. However, if you install either a double-high or a quad-high connector adapter (see page 40), some adapter positions are eliminated. In this photo, position J2 is eliminated because a double-high adapter has been installed in positions J1 and J2. A single-high adapter has been installed in position J4. In this example, the next position sensed by the analyzer during testing will be J4. The cable documentation will show interconnections for J1 and J4, but not J2 or J3.

Double-high adapter in J1-J2, single-high adapter in J4

Install adapters lowest-numbered first

When you install connector adapters, you must install them beginning with the lowest-numbered “J” positions first. For example, if you intend to use adapter positions J2 and J4, first install the connector adapter at position J2. Then install the connector adapter at position J4. If you don’t do this (especially if you’re installing more than one type of adapter), you may find that the connector adapters won’t fit the scanner assembly correctly.

Sample wirelist showing connector adapters

Here is a portion of a cable’s printed documentation showing how single-high and double-high connector adapters usually appear.

```
SIGNATURE 1000H+ CABLE DOCUMENTATION
______________________________________

CABLE SIGNATURE: Z06A1            CABLE PART NUMBER:____________
PARAMETER SIGNATURE: 6J0A0
J1-ADAPTER SIGNATURE: D507F1    CONNECTOR DESCRIPTION_______________
J4-ADAPTER SIGNATURE: 03FAC1    CONNECTOR DESCRIPTION_______________
CABLE DESCRIPTION:_____________________________________________

CONNECTION RESISTANCE           <AUTO .5 ohm
HIPOT VOLTAGE                   300 V
INSULATION RESISTANCE           > 10 M ohm
DURATION PER NET                100 MS
APPLY HIPOT TO                  ALL ADAPTER PINS
NO. COMMON CONNECTION LIST:
1 J1-01 J4-01
2 J1-02 J4-02
3 J1-04 J4-08
4 J1-05 J4-09
5 J1-03 J4-03
```

Section 10: Select a Test Procedure

Types of Tests

Types of Tests
Using the Cirris 1000H+, you can perform three different kinds of tests. These are:

1. Simple tests.
2. Complex tests.
3. Hipot tests.

Simple Tests

Simple tests are used for testing cables made up of only wires and connectors. These cables have no resistors, capacitors, diodes, or any active circuitry. Set the Connection Resistance to a low number (typically less than 10Ω). Depending on the capacitance of the cable, set the Insulation Resistance to a higher setting.

This table will give you general guidelines for setting up simple tests. You can adjust the settings to meet your specific needs.

General Guidelines for Simple Tests (continued on next page)

Test Type	Conn. Resis.	Ins. Resis	Hipot Voltage	Hipot Duration	Comments
Calculating resistances only	CALC	N/A	OFF	N/A	Use *CALC* to help you determine where to set your Conn. Resis. threshold. *CALC* several cables, then set your own threshold. **Do not** use *CALC* for testing!
Automatic test	AUTO	100KΩ	OFF	N/A	*AUTO* selects a Conn. Resis. threshold for you. It takes the highest resistance measured between any two points and adds 20%. **Warning!** If you get a Sample Cable with a high resistance when learning in *AUTO*, you may be testing at a much higher threshold than you want. Use *CALC* to determine a proper connection threshold, then set it yourself.
Fast test	1KΩ	1KΩ	OFF	N/A	The fastest possible test. This setting effectively makes the analyzer act like a continuity tester.
Long cable test	10Ω	5.0MΩ	100V	100mS	These settings are for low Connection Resistance, mild hipot testing. They allow you to test cables that are long, or that have high capacitances.

Typical test	0.5Ω	100MΩ	300V	100mS	Use these settings when low connection resistance is important, and the cable has little capacitance. Low connection resistance may require careful adapter maintenance. The hipot test will not work on extremely long cables.
Stringent test	0.5Ω	500MΩ	630V	10 seconds	Use these settings for slow, stringent testing when you need low connection resistance and extremely good insulation resistance. Maintain connector adapters carefully! Works only with clean adapters in low relative humidity.
Complex test	Ins. Resis 100KΩ or more Connection Resis. Default setting 5 ohms. Conn. Resis. must be set to greater than highest wire resis, and lower than lowest component resis.		optional	optional	Set *CREATE TEST FROM* option to *COMPLEX ASSEMBLY* to learn an assembly that contains resistors, diodes, divider networks. When you choose this setting, Conn. Resis. refers to the resis. level that definitely separates wires from resistors. The analyzer sets this to a default 5 ohm level. You can set the Conn. Resis. option to *CALC*, then learn the cable to determine a better setting.

Complex Tests

Complex tests are for cable assemblies that contain components such as diodes or resistors. To help you make use of complex tests, we will show you these things:

1. How to determine the correct Connection Resistance setting for a complex assembly.

2. How to set the testing options for learning a complex assembly, then learn it.

3. How to document a complex assembly, then interpret that documentation.

4. How to test a complex assembly.

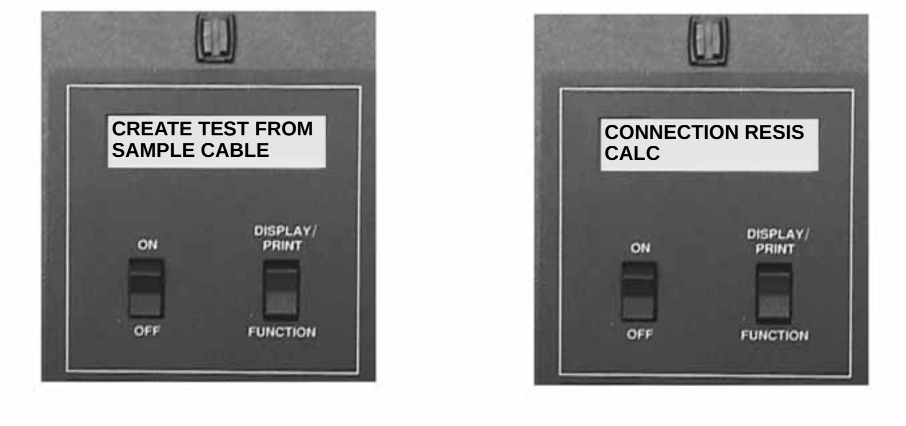
How to determine a Connection Resistance setting for complex tests.

When you set the option Create Test From to **Complex Assembly**, you must set the Connection Resistance to a value that is greater than the highest wire resistance, and less than the lowest component resistance; a resistance level that definitely separates wires from resistors. The 1000H+ automatically sets the Connection Resistance to a default value of 5 Ω. You can change this value to suit your needs. **Note**: If you don't know what Connection Resistance setting is appropriate for the cable(s) you are going to test, you can determine a good value by using the analyzer's CALC feature. See page 19 for details on how to do this.

To determine the proper Connection Resistance setting for a cable, do these things:

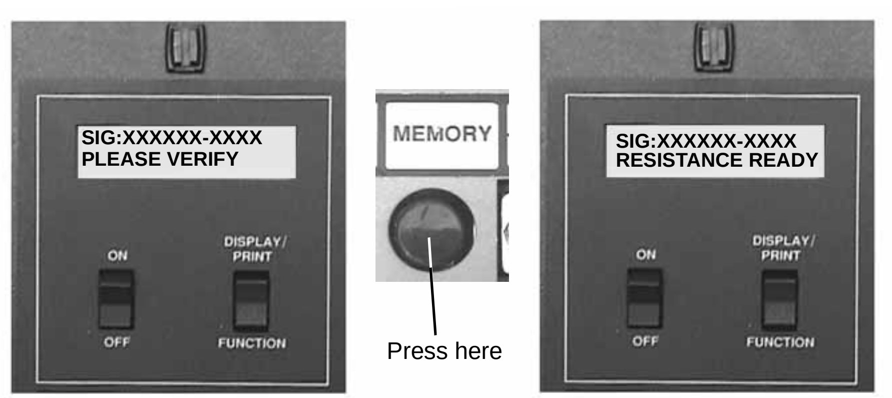
1. Set the Create Test From option to **Sample Cable**.

2. Set the Connection Resistance setting to **CALC**.

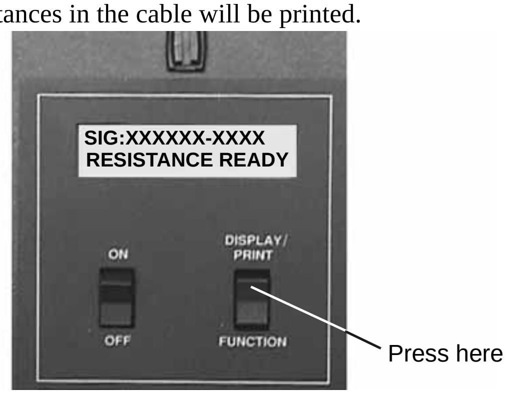


3. Turn on the analyzer, and learn the cable.

4. When the display prompts **Please Verify**, press the Memory button on the back of the analyzer. The prompt will change to **Resistance Ready**.



5. When the prompt changes to **Resistance Ready**, press Display/Print. A list of the measured resistances in the cable will be printed.



6. From your printout locate these resistances:

   - The <u>highest</u> measured resistance for nets that you know contain only wires.

- The <u>lowest</u> resistance for nets that you know containing components which exhibit resistance.

You can now choose a midrange setting from the high and low resistances shown in your printout. For example, this printout shows that net 4 contains a resistor, and has a resistance of 20 ohms. Net 1, which is only a wire connection, has a resistance of .1 ohm. All other nets have a zero resistance. Therefore, when you set Connection Resistance for testing a complex assembly, you could select any value from .1 ohm to 20 ohms. As you can see, the automatic default setting of 5 ohms falls well within this range.

```
CABLE SIGNATURE 6CEEOD
---------------------------------------------------------

1 J1-001 J2-001
  RESISTANCE .1 ohm            Highest wire resistance .1 ohm

2 J1-002 J3-002
  RESISTANCE .0 ohm

3 J1-003 J3-003
  RESISTANCE .0 ohm
                               Lowest component resistance 20 ohm
4 J1-004 J3-004
  RESISTANCE 20 ohm

5 J1-005 J3-005
  RESISTANCE .0 ohm

6 J1-006 J3-006
  RESISTANCE .0 ohm

7 J1-007 J3-007
  RESISTANCE .0 ohm

8 J1-008 J3-008
  RESISTANCE .0 ohm

9 J1-009 J3-009
  RESISTANCE .0 ohm
```

7. Set the Connection Resistance to a value <u>greater</u> than the highest wire resistance, and <u>less</u> than the lowest component resistance.

How to set the options to learn a complex assembly

To set the options for learning a complex assembly, do these things:

- If the default Connection Resistance setting of 5 ohms is not appropriate for the cable you want to test, set it to a value between the highest wire resistance, and the lowest component resistance in the cable.

- Set the Create Test From option to Complex Assembly, then turn off the analyzer.

How to learn a complex assembly

1. Install the correct cable adapters, then connect the assembly you want to learn to the analyzer

2. Turn on the analyzer to learn the cable assembly.

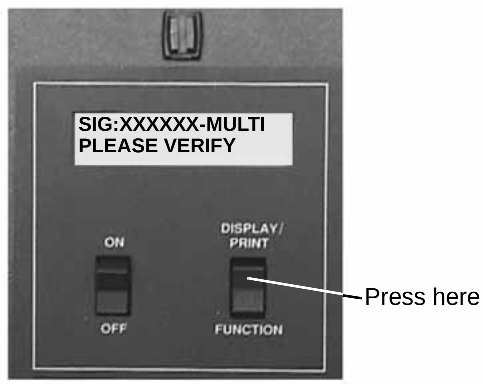
The analyzer first prompts **Learning Cable**, as it learns all interconnections in the cable which have resistances up to the Insulation Resistance setting you have selected.

The prompt changes to **Learning Complex** as the analyzer learns the pattern of wires which have resistances less than the Connection Resistance setting.

The prompt finally changes to **Creating Checks** as the analzyer learns the resistors and diodes in the cable. The analyzer sets the accuracy of the resistor check to a default value of 10%. You can change this value using CTL or CTLynx from Cirris Systems. **Important!** If you change this value, the analyzer's accuracy (4%) should always be added to the expected accuracy of the resistance.

How to document a complex assembly

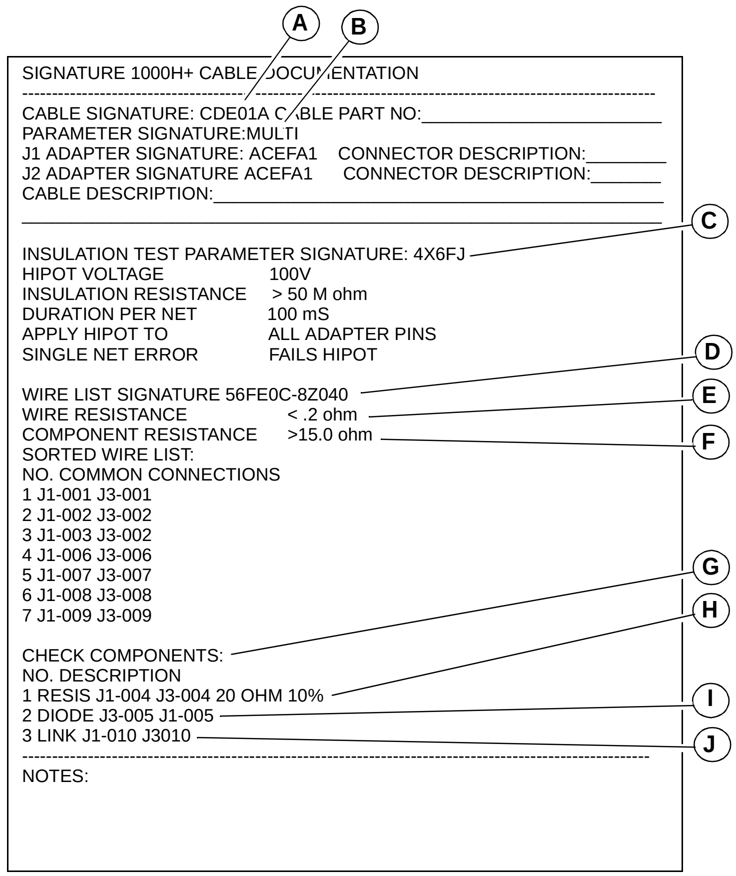
When the analyzer has finished learning a complex assembly, it prompts **SIG:XXXXXX-MULTI Please Verify**. Either press Display/Print to print out the documentation, or transcribe the documentation by hand.



Please see next page...

How to interpret documentation from a complex assembly

Documentation from a complex cable assembly differs from that of a simple assembly in some ways. We'll go over an example printout in detail.




```
SIGNATURE 1000H+ CABLE DOCUMENTATION
---------------------------------------------------------------------------------------------------------
CABLE SIGNATURE: CDE01A CABLE PART NO:________________________
PARAMETER SIGNATURE:MULTI
J1 ADAPTER SIGNATURE: ACEFA1    CONNECTOR DESCRIPTION:________
J2 ADAPTER SIGNATURE ACEFA1     CONNECTOR DESCRIPTION:_______
CABLE DESCRIPTION:_____________________________________________
_______________________________________________________________

INSULATION TEST PARAMETER SIGNATURE: 4X6FJ
HIPOT VOLTAGE                100V
INSULATION RESISTANCE        > 50 M ohm
DURATION PER NET             100 mS
APPLY HIPOT TO               ALL ADAPTER PINS
SINGLE NET ERROR             FAILS HIPOT

WIRE LIST SIGNATURE 56FE0C-8Z040
WIRE RESISTANCE              < .2 ohm
COMPONENT RESISTANCE         >15.0 ohm
SORTED WIRE LIST:
NO. COMMON CONNECTIONS
1 J1-001 J3-001
2 J1-002 J3-002
3 J1-003 J3-002
4 J1-006 J3-006
5 J1-007 J3-007
6 J1-008 J3-008
7 J1-009 J3-009

CHECK COMPONENTS:
NO. DESCRIPTION
1 RESIS J1-004 J3-004 20 OHM 10%
2 DIODE J3-005 J1-005
3 LINK J1-010 J3010
---------------------------------------------------------------------------------------------------------
NOTES:
```

A. This cable signature represents the wirelist combined with a signature for the components.

B. A MULTI parameter signature indicates that this documentation was created with the Create Test From option set to Complex Assembly.

C. The Insulation Test Parameter Signature represents the settings used for the insulation test.

D. The Wire List signature represents the connections and settings for the wire test. It's followed by a list of all wire interconnections.

E. The Wire Resistance is the <u>highest</u> allowable point-to-point above resistance that is below the Connection Resistance setting.

F. The Component Resistance is the <u>lowest</u> available point-to-point resistance above the Connection Resistance setting.

G. This is Check Components. Each line that follows is an independent test for specified points. They can be resistors, diodes, or links.

H. This indicates that a resistor is present in the cable. It shows two points, a resistance, and a percentage. The resistance is measured between J1-003 and J1-004. If the measured resistance is more than 22 ohms, or less than 18 ohms, it falls outside the specified 10% tolerance for the resistor, and the analyzer reports an error.

I. This line indicates that a diode is present in the cable. It is connected between J3-005 (the anode), and J12-005 (the cathode).

J. This shows two points that were somehow linked in the learned Sample Cable, but a specific test was not created for them. This occurs when the Insulation Resistance is set higher than 100KΩ, and a connection exists between 100KΩ and the Insulation Resistance. It also occurs in a cable with a complex system of resistors which the analyzer cannot completely unscramble on its own.

How to test a complex cable assembly

To test a complex cable assembly, do these things:

1. Set the test options (see page 17 for instructions on how to do this), then connect a Sample Cable (a cable that you know is built correctly) of the kind you want to test, to the analyzer.

2. Learn and document the Sample Cable.

3. Disconnect the Sample Cable, then connect a cable that you want to test.

First pass of a complex test

Insulation Test

First, the analyzer does a low voltage insulation test to verify that points which are not supposed to be connected are in fact, not connected.

- If you have set a hipot voltage, this test is supplementary to the hipot test that will be conducted later. It is used to find gross errors.

- If you have not set a hipot voltage, this test is the insulation portion of the complex test, and the analyzer will use the insulation test parameters you've set.

Wires Test

Second, the analyzer does a wires test (checking connections without resistors) using the wirelist test parameters. If it detects an error, the analyzer loops on this test.

Check Components Test

Third, the analyzer tests individual components. If it detects an error, the analyzer loops on that specific check.

- If the analyzer detects an error during any of these three tests, press Display/Print to print out an error list.

- If the analyzer detects no errors, it will continuously loop on the first three tests until you disconnect the cable.

Hipot Test

If you have set a hipot voltage, and the analyzer does not detect any errors during the

previous tests, it will prompt **Ready To Hipot**.

- If the Auto Hipot option is set to ON, the analyzer will automatically perform a hipot test after the cable has passed all other tests.

- If the Auto Hipot option is set to OFF, the analyzer will prompt **Ready to Hipot**. You must press Function to begin a hipot test.

Limitations when testing complex assemblies

When you test complex assemblies, remember these things:

1. Any connections which have resistances between the Wire Resistance and the Component Resistance are seen by the analyzer as errors. The resistances are too low to be seen as components, and too high to be seen as wires.

2. The connection pattern for test points which have resistances below the Wire Resistance must match the wire connections specified in the cable's documentation.

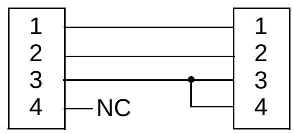
3. All points in a cable assembly that are not connected by either components or wires must be insulated from each other by resistances which are greater than the Insulation Resistance setting.

4. All connections which have resistances that fall between the Component Resistance setting and the Insulation Resistance setting are seen by the analyzer as components. They must have a corresponding Component Check, and must pass the test for that check.

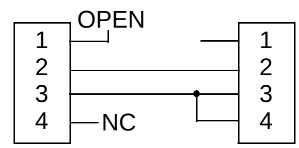
Hipot Testing

The purpose of hipot testing is to test the effectiveness of the insulation on a cable assembly.When you hipot test, you are making sure that there is extremely high electrical resistance between points that should <u>not</u> be connected in the cable or harness.

Important note! Before the analyzer performs a hipot test, it performs a connection resistance test (sometimes called a continuity test) to make sure that all connections in the cable are correct. If the analyzer finds any open or shorted connections during the continuity test, it <u>will not</u> perform the hipot test.

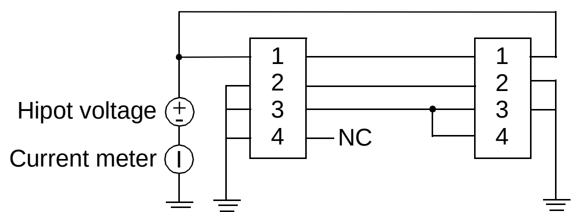


This is a known-good cable with all connections intact.

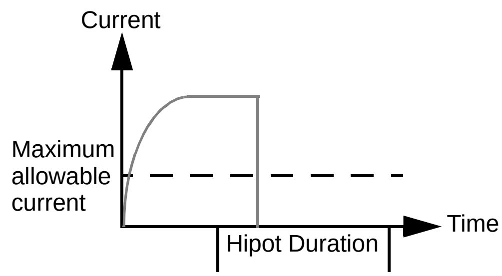


Example of the same cable with an open connection. The hipot test cannot be done on this cable.

Once a cable passes the continuity test, the analyzer can begin a hipot test. The analyzer applies high voltage to a group of connected pins (“nets”). The remaining pins are tied together. In the example below, we see net number 1 being hipot tested.



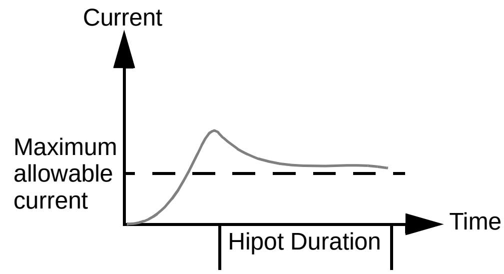
Remember that each net the analyzer tests has capacitance to every other net. That means there is a current surge as this capacitance is charged. The analyzer carefully monitors this current surge. The amount of current tells the analyzer how much energy is being delivered to the cable. If the current delivered is excessive, the amount of energy delivered might be dangerous; therefore, the analyzer shuts off the high voltage and fails that net, labeling it “Over Current”



Overcurrent error

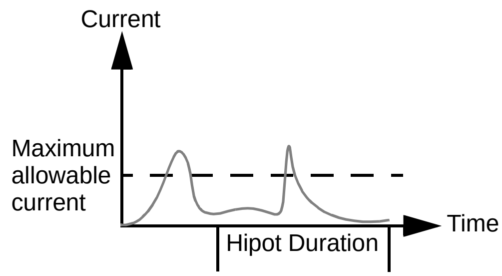
If the current surge subsides to an acceptable level, the hipot test continues. The analyzer has already calculated the maximum amount of current it will allow based on the Insulation Resistance and Hipot Voltage option settings you’ve chosen (see

page 20). The current flow is monitored during the hipot duration you have set, to make sure it does not exceed the maximum allowed current. If the current flow stays below the maximum allowed current for the hipot duration, the net passes the test. If it does not stay below the maximum allowed current, the net fails the hipot test, and the analyzer labels it "Has Leakage." **Note**: The analyzer does not check where the current flows; it only knows that too much current is leaving the high voltage power supply.



"Has Leakage" error

If the current flow spikes above the maximum allowable current during the hipot duration, the analyzer shuts off the high voltage, and labels the cable as having a dielectric failure.



Dielectric Failure

Tips on selecting Hipot Voltage settings

Remember, when you select a hipot voltage, you are setting the amount of voltage to be applied between pins that are not connected. Remember these things when you select hipot voltage settings:

- The more voltage you use, the more likely the analyzer is to detect contamination between pins, or frayed wires that almost create a short circuit. However, higher test voltages only work well on cables with little pin-to-pin capacitance.
- Higher voltage settings require greater pin-to-pin spacing on cable connectors.
- Subjecting a cable assembly to excessive voltage may degrade its future performance. Use the lowest voltage setting that still finds insulation problems in a cable. Most cables require no more than 630 volts. Most ribbon cables are designed to handle a maximum of about 300 volts.
- The hipot test applies high voltage to a net (a group of connected pins) and measures the current that flows from the net. The analyzer does not determine which net or pin the current is flowing to. This means that if several nets have leakage, you cannot tell which nets leak to each other.

Hipot voltage and capacitance problems

Excessive capacitance in a cable assembly is a major consideration when you are deciding on what Hipot Voltage, Hipot Duration, and Insulation Resistance settings to use. If a cable has shielding or a grounded net, capacitance problems are more likely to occur. Remember these things:

- In general, the higher the capacitance a cable has, the lower a hipot voltage setting you'll be able to use. See page 20 for further information.
- If you find that a cable has excessive capacitance, first try lowering the Hipot Voltage setting. You may also set the Single Net Error option to Is Ignored. This will cause the analyzer to ignore a single-net hipot failure. (A single-net hipot failure is an indication of the presence of a net with high capacitance, a net with too many points, or a net that tests as borderline.) Normally, hipot failures show up with at least two failed nets.
- If you've set the Apply Hipot option to Connections Only, the analyzer will not detect leakage of a single net to any unconnected pins.

Tips on selecting Insulation Resistance settings

Remember, when you select an Insulation Resistance setting, you are specifying the lowest resistance that should appear between unconnected points. See page 20 for more information on Insulation Resistance versus Hipot Voltage settings. Remember these things:

- Using the highest setting might increase your chances of finding some kinds of errors. You might not want to use an extremely high setting. Oil, solder flux, or fingerprints left over from the manufacturing process can become conductive in high relative humidity conditions.
- If you are testing in relative humidity conditions above 75%, you may have more failures when you test at 500 megohms, or even 200 megohms.
- In general, select an Insulation Resistance setting that is lower than the resistance of normal contamination on the cable.

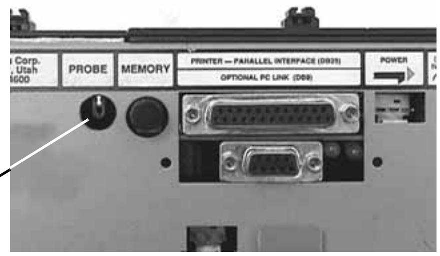
Section 11: Rework and Guided Assembly

The hand-held test probe

You can connect a hand-held test probe (provided with your analyzer) to the 1000H+. It will help you quickly identify test points as you rework or assemble cables. **Note**: The probe works only when the analyzer is in the rework mode. It will not function when the analyzer prompts **Ready to Test** or **Please Verify**.

Installing the probe

Plug the probe into the connector labeled Probe on the back of the analyzer. This photo shows the location of the probe jack.



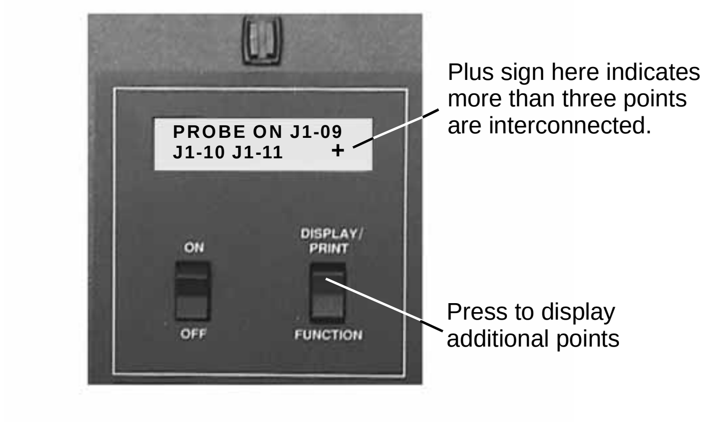
Plug the probe in here

Example: Identifying test points using the probe

While the analyzer is in the test mode, touch the tip of the probe to the connector pin or wire you want to identify. For example, if you touch the probe tip to position J1, pin 11, the analyzer will prompt **Probe On J1-11**.

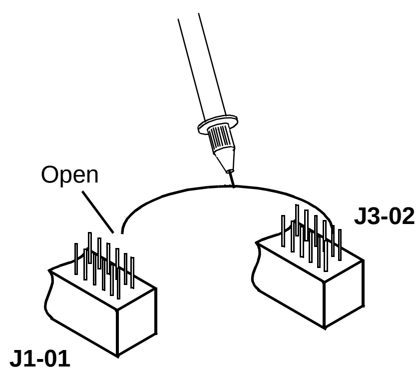
Displaying multiple interconnected pins

Up to three different pins can be displayed at the same time. If more than three pins are interconnected, a plus sign (+) will appear in the lower right-hand corner of the display. To view any additional interconnections, press Display/Print.



Using the probe to identify an open circuit

Using the probe, the analyzer can detect which end of an interconnection has an open. When the analyzer prompts an open, use the sharp metal tip of the probe to pierce the insulation of the wire that should connect between the two pins. The pin shown in the display is the pin that has a good connection to the wire. The pin that is **not** displayed is the open.



Rework instructions

Before you begin reworking a cable assembly, remember these things:

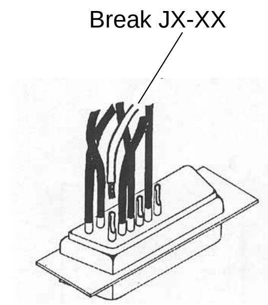
- If you have a printer connected to your analyzer, either turn it off or disconnect it.
- When the analyzer displays errors, pressing Display/Print once will put the analyzer into rework mode. If you press Display/Print twice, the analyzer will just prompt all the errors it detects.

Please see next page...

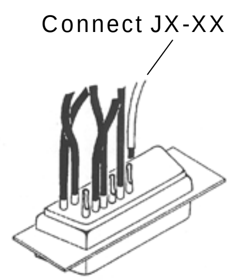
Removing shorts within a net

If the analyzer detects a short, follow these steps:

1. Press Display/Print once to put the analyzer into rework mode. The analyzer will prompt **Break JX-XX**, where X indicates the adapter position and the pin number. Break all connections indicated in the display



2. When you break a connection, the analyzer will prompt the next short. When all the shorts have been broken, the analyzer will prompt the net and point to which you should connect JX-XX. Connect JX-XX to the point indicated in the display.



3. Once you've corrected all the shorted connections, the analyzer will either prompt **Good Cable**, or **Connect JX-XX**. If the analyzer prompts **Break JX-XX**, you have created another short. Go back to step 2 and try again. **Note**: The

analyzer may prompt **Intermittents** as you rework the connection. To clear this prompt, press the Memory button on the back of the analyzer.

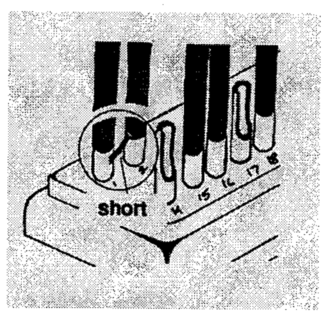
Cable has been corrected

You've created another short.
Go back and try again

Removing shorts between nets

If the analyzer detects short circuits in the cable or harness you are testing, it will tell you where to make cuts to correct the shorts. This will happen if two <u>nets</u> should become shorted. To correct a detected short, do these things:

1. The analyzer will prompt **Cut JX-XX From JX-XX**, where X indicates the adapter positions and pin number.



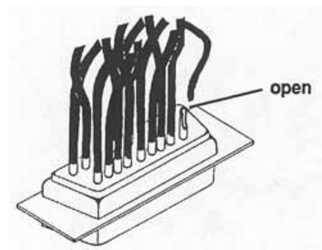
2. Locate the short between the nets, and remove it.

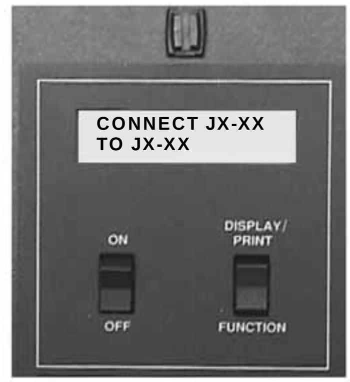
Please see next page...

Correcting opens

If the analyzer prompts **Connect JX-XX to JX-XX** indicates that the cable you're testing has an open circuit. To correct an open, follow these steps:

1. Locate the open circuit prompted in the analyzer's display.





2. Make the correct connections in the cable as indicated.

    - Once you've connected all the opens, the analyzer should prompt **Good Cable**.

    - If you should happen to create another short, the analyzer will prompt **Break JX-XX**.

Guided Assembly

Building cables pin-to-pin

To use guided assembly to build pin-to-pin cables, follow these steps:

1. Following the documentation for the kind of cable you want to build, install the correct connector adapters onto the 1000H+, then replace the cover plate.

2. Either connect a Sample Cable of the kind you want to build, or retrieve the correct wirelist from memory (see page 31 for instructions on how to do this). **If you use a retrieved wirelist**, skip step 3, and go directly to step 4.

3. Turn on the analyzer and learn the Sample Cable, then disconnect the Sample Cable.

4. Install the same kinds of connectors used in the Sample Cable onto the cable adapters already installed in the analyzer.

5. Make the first connection in your cable that is specified in the documentation. The analyzer should prompt **Open Detected**.

    - If the analyzer prompts **Errors Detected**, you have not connected two points that should be connected; you have created a short instead. If you have created a short, break it, and go back to make the first good connection.

6. Once the analyzer prompts **Open Detected**, press **Display/Print** <u>once</u>. The analyzer will prompt you with the next set of points you should connect.

7. Connect the next set of points prompted by the analyzer. If the connection is correct, the analyzer willdisplay **Attach JX-XX to JX-XX**.

8. Repeat the last step by connecting the next set of points prompted. If you create a short, the analyzer will prompt **Break JX-XX**.

9. Continue connecting points as prompted by the 1000H+ until the analyzer prompts **Good Cable** or **Ready To Hipot**. This indicates you have finished wiring the assembly.

Building cables that have one end terminated with a connector

To build cables that have only one end terminated, follow these steps:

1. Following the documentation for the kind of cable you want to build, install the right cable adapters onto the analyzer, and replace the cover plate.

2. Either connect a Sample Cable of the kind you want to build to the analyzer, or retrieve the wirelist for the kind of cable you want to build from the analyzer's memory (see page 31 for instructions on how to do this). **If you use a wirelist retrieved from memory**, skip step 3 and go directly to step 4.

3. Turn on the analyzer and learn the Sample Cable, then disconnect the Sample Cable.

4. Insert the connector on the terminated end of the cable into the cable adapter on the analyzer.

5. Insert an empty connector of the type correct for the cable into the other cable adapter on the analyzer.

6. Plug the probe into the Probe jack on the back of the analyzer.

7. Make the first connection specified in your cable's documentation. The analyzer should prompt **Open Detected**.

   - If the analyzer prompts **Errors Detected**, you have created a short instead of connecting the two points that should be connected. Break the short, check your build list, and try again until the analyzer prompts **Open Detected**.

8. Press Display/Print to enter rework mode.

9. Probe the loose end of one of the wires. The display will prompt Probe On **JX-XXX**. Connect this wire to the appropriate pin on the empty connector, according to your cable documentation.

10. If you create an error, the display will read **Break JX-XXX**. Remove the error, then try reconnecting the loose wire at the correct position.

11. Continue until the display reads either **Good Cable**, or **Ready to Hipot**.

Section 12: Troubleshooting

What is in this section?

In this section we will tell you how to deal with three basic kinds of trouble which may occur when you are working with your 1000H+. These are:

- Error messages as prompted by the analyzer in its display.
- General problems with the analyzer.
- Problems with printing.

Need more help? Call us!

Each section will help you solve problems you might have with your analyzer. You may be able to correct some of the problems yourself. If you find that the problem is a defective microprocessor or scanner assembly, or if for some other reason you cannot solve the problem yourself, please contact our customer support team at Cirris by calling 1-801-973-4600, or 1-800-441-9910. When you call, please have the following information ready:

- What model of analyzer do you have?
- Purchase date (if you know it).
- What is the analyzer's serial number?
- What have you done to try to solve the problem?

Please have your analyzer set up near your telephone so you can duplicate troubleshooting steps as our customer service team talks with you.

Please see next page...

Error Messages

Every time you turn on your analyzer, it performs a complete self-test. If there is a problem in one of its systems, the analyzer will display an error message. If you see any of these error messages, call us at 801-973-4600 or 800-441-9910. This section lists all of the possible error messages, and some of the possible causes.

10 V HIGH | **10 V LOW** | **10 V NOISY**

Problem: The main power supply (located on the microprocessor assembly) is not working properly. This supply is powered from the wall mount transformer cube.

Possible Causes:
- A loose cable from the microprocessor assembly to the analog board
- Loose (or bad) wall transformer.
- Bad microprocessor assembly.
- Bad analog board.
- Bad scanner assembly.
- Incorrect line voltage in use (for example, 120 volts instead of 240).
- Line voltage is either too high or too low.

---

8 V HIGH | **8 V LOW** | **8 V NOISY**

Problem: The measurement power supply (located on the analog board) is not working properly.

Possible Causes:
- A loose cable from the microprocessor assembly to the analog board.
- Bad microprocessor assembly.
- Bad analog board.

NEG V HIGH | **NEG V LOW** | **NEG V NOISY**

Problem: The negative voltage supply (located on the microprocessor assembly) is not working.

Possible Causes:
- A loose cable from the microprocessor assembly to the analog board.
- A loose cable from the analog board to the scanner boards.
- Bad microprocessor assembly.
- Bad scanner assembly.
- Bad analog board.

Please see next page...

```
6.2 ma ERROR xxx
 110 < X 180
```

Problem: The current source (located on the analog board) needed for this test is not working.

Possible Causes:

- A loose cable from the microprocessor assembly to the analog board.
- Bad analog board.

```
OFFSET_C BAD xxx
66 < X <79
```

```
OFFSET C_BAD xxx
X > 100 ON G8
```

```
OFFSETF_HxxxLxxx
36 < X , 47
```

```
OFFSET COARSE
CANT GET TO 25
```

```
OFFSET FINE
CANT GO TO 23
```

Problem: The measurement system (located on the analog board) cannot control the input signal.

Possible Causes:

- A loose cable from the microprocessor assembly to the analog board.
- Bad analog board.

```
LOW CURRENT CAL
 ERROR xxx
```

```
OFFSET CAL ERROR
nnn
```

```
GAIN xx X vvv
```

```
CANT ADJUST
OFFSET COARSE
```

```
CANT ADJUST
OFFSET FINE
```

```
CALIB. # xxx
HI<= LO
```

```
CALIB # xxx
HI-LO=vv OPB=nnn
```

Problem: The analyzer was unable to calibrate the measurement system (located on the analog board).

Possible Causes:

- Bad analog board.

Please see next page...

Problem: A problem with the high voltage system (located on the analog board) was found.

Possible Causes:

- The relative humidity in the surrounding environment is above 75%.
- The analyzer has been exposed to solvents or contamination.
- Moisture has condensed on the analyzer.
- A loose cable between the analog board and the scanner assemblies.
- Bad scanner assembly.
- Bad analog board.

Problem: The current source (located on the analog board) used to test the scanners is not working properly.

Possible Causes:

- A loose cable between the analog board and the scanner assemblies.
- A loose daughter board on a scanner assembly.
- Bad daughter board.
- Bad scanner assembly.
- Adapter on scanner has pin connected to earth ground.

Problem: The first scanner cannot be found.

Possible Causes:

- A loose cable between the analog board and the first scanner assembly.
- The first scanner daughter card is not installed.
- Loose daughter board in first scanner position.
- First scanner daughter card is bad.
- Bad analog board.

Please see next page...

SCANNER OUT OF SEQUENCE

Problem: One of the scanners is missing, or is not connected correctly to the analyzer.

Possible Causes:

- Scanner boards not installed properly.
- A loose cable from the analog board to the scanner board.
- Loose scanner daughter card.
- Bad scanner daughter card.
- Bad scanner mother board.
- Bad cable from analog board to scanner boards.
- Bad analog board.

BOX n DB V PT nn SCR ERR | **BOX n DB V PT nn SNK ERR** | **BOX n DB v PT nn CLR ERR**

Problem: A test point on a scanner board is not functioning properly. The point is located on daughter board 'v' on scanner assembly 'n.'

Possible Causes:

- Loose scanner daughter board.
- Cable or harness presently connected to analyzer has a point connected to earth ground or to some power source.
- A loose cable from the analog board to the scanner assembly.
- Bad scanner daughter board.
- Bad analog board.

General Problems with the Analyzer

There are problems you may see with the analyzer that are not detected by the analyzer's own internal tests. We will talk about those here.

Problem: No display and no sound. The analyzer's display is totally blank.

Possible Causes:

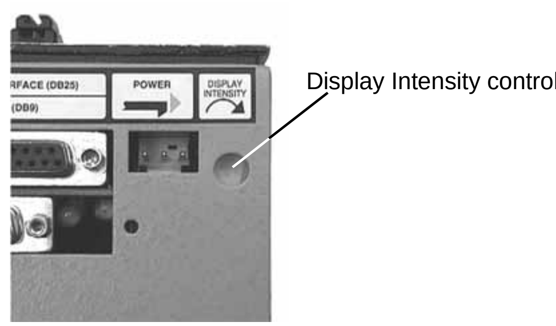
- Bad 10 VAC wall mount transformer.
- The intensity control for the display is not adjusted correctly.
- Bad microprocessor assembly.

Things to do:

1. Be sure the wall transformer is plugged into a live wall outlet, then feel if it is warm. If the transformer stays cold, it is probably bad. If the outlet is good and the transformer is bad, call Cirris to replace the transformer.

2. If the transformer feels warm, check to see if the microprocessor assembly feels warm. It should warm up within about five minutes after you turn it on. If it is still cold after five minutes, the transformer is bad. Call Cirris to replace it.

3. If the microprocessor assembly feels warm and the display has a blue background, but is otherwise blank, adjust the Display Intensity control at the back of the analzyer by turning it clockwise. If the display is still blank, call Cirris to replace the microprocessor assembly.



4. If the microprocessor assembly is warm, but the display is totally blank, or there is no blue background showing in the display, call Cirris to replace the microprocessor assembly.

Problem: Display shows a darkened row, or gibberish characters.

Possible Causes:

- Display Intensity control is not adjusted properly.
- Scanner assembly is bad.
- Microprocessor assembly is bad.

Things to do:

1. If both rows of the display are dark, try adjusting the Display Intensity control at the back of the analyzer by turning it counterclockwise. If this does not solve the problem, go to step 2.

2. Turn off the analyzer, disconnect the microprocessor from the rest of the system, then turn on the microprocessor. The analyzer should prompt **10 V LO**. If it does, the analog board or one of the scanner boards is bad. Call Cirris to replace it.

3. If the problem is not solved after the microprocessor is disconnected, the microprocessor assembly is probably bad. Call Cirris to replace it.

Problem: When a cable is disconnected, the display still prompts **Please Verify**.

Possible Causes:

- A cable adapter is bad, or adapting cables are bad.
- The scanner assembly is defective.

Things to do:

1. Remove the cable adapters from the analyzer while the analyzer is still on. If the analyzer still prompts **Please Verify**, the scanner is probably defective. Call Cirris to replace it.

2. If the analyzer prompts **Ready To Test** after step one is done, you have unwanted connections in your cable adapters or adapting cables.

Problem: Connections are not recognized by the analyzer.

Possible Causes:
- Bad cable adapters or adapting cables.
- Bad scanner assembly.

Things to do:

1. Using the hand-held test probe as a diagnostic tool, use the sharp steel tip of the probe to pierce the insulation on the connecting wire for the connection that is not being recognized. The pin which is displayed by the analyzer when the insulation is pierced is the pin that makes a connection to the wire. The pin that is not displayed is the one that is open. Remove the connector and check the connector adapter with the probe to see if the missing pin is recognized there. If it is recognized at the test adapter, you may have a worn contact, or contaminants such as solder flux on the contacts.

2. If you are using an adapting cable, move back to the test point on the adapter connected to the analyzer, and see if the analyzer will recognize it there. If the analyzer recognizes the point, the adapting cable is bad. Rework the adapting cable.

3. If you are using an AUNV-64, or AHR2-64 adapter, be aware that some pins are used to identify these adapter's signatures. Because they are incorporated into the adapter signature, these connections may cause test points to no longer be recognized. If this is the case, you have miswired your connections, and you will have to rework them.

    - To isolate a problem with an AUNV adapter, remove all connections to pin 31, 32, 33, and 34 on a 34-pin connector adapter.

    - If you are using an AHR2-64 adapter, make sure there are no connections to pins 33 and 34.

    - If after removing these connections you can now identify these pins with the probe, you have found the type of miswire described above. Rework your adapting cable.

    - It is possible the adapter is bad. Check for worn connectors on the adapter. Also check for continuity of the adapter pin on the bottom of the adapter to the test connector on top. If you find open or worn connections, replace the adapter.

    - If you find a bad pin after all these tests, call Cirris to replace the scanner assembly.

Please see next page...

Problem: The analyzer stops operating while it is being used.

Possible Causes:
- Damage from static electricity.
- Bad microprocessor assembly.
- Overheating.

Things to do:

1. If static electricity may be a problem, be sure the safety ground on the wall plug is connected. Take measures to control static in your work area.

2. If the microprocessor is bad, call Cirris Systems to replace the microprocessor assembly.

3. If overheating may be a problem, let the analyzer cool for a few minutes. It it comes back on, you may want to direct a cooling fan on the analyzer.

Problem: Speaker problem. There is no sound, but the display works.

Possible Causes:
- The Error Tones option is set to OFF.
- The speaker inside the analyzer is not plugged in.
- The microprocessor assembly is bad.

Things to do:

1. If you hear clicking sounds for cables that test as good, but no sounds for cables that test as bad, the Error Tones option is set to OFF. See page 17 for instructions on how to change the option setting.

2. Connect the speaker wire to the microprocessor assembly.

3. If the speaker wire is connected, but the sounds still do not work, call Cirris to replace the microprocessor assembly.

Problem: The sounds the analyzer makes disturb others.

Things to do:

- Set the Error Tones option to OFF or Low.
- Place tape over the speaker opening in the metal case to dampen the sounds.
- Disconnect the speaker from the microprocessor.

Please see next page...

Problem: Analyzer will not learn a cable.

Possible Causes:
- The Create Test From option is set to Last Cable.
- The Connection Resistance threshold, or Insulation Resistance threshold is not set properly.

Things to do:

1. You cannot learn a cable's wirelist when the Create Test From option is set to Last Cable. Change the option setting to Sample Cable. See page 17 for instructions on how to do this.

2. If the Insulation Resistance is set to less than the Connection Resistance (which can take place if the Connection Resistance option is set to AUTO), then the analyzer will prompt **Insulation Resis <AUTO.XXX**. The Insulatioin Resistance should be raised to a value above the Connection Resistance setting.

Problems with Printing

Printer failures usually take place because of one of four things:

1. User error.

2. A bad printer.

3. A bad cable.

4. A bad microprocessor assembly.

These guidelies will help you solve printing problems:

Problem: Nothing prints.

Possible Causes:
- Printer is not on-line (selected).
- Cable between analyzer and printer is not connected properly.
- The printer has a serial instead of a parallel interface.
- A bad cable.
- A bad printer.
- A bad microprocessor assembly.

Things to do:
1. Make sure the printer is turned on, on-line (selected), and not out of paper.

2. Check the cable connections at the analyzer and the printer. The cable should be firmly connected to the back of the analyzer where it is marked Printer-Parallel Interface. Check the connection at the printer end too.

3. Your printer must have a parallel cable interface. Do **not** use a printer with an RS-232 serial interface. You will damage the analyzer.

4. The cable running from the analyzer to the printer may be bad. Try another cable to see if it works.

5. The printer may be bad. Try using another printer, or test your original printer and cable with a standard computer. If the printer does not work with the PC, it is probably bad.

6. If the cable and printer work with a PC, the microprocessor assembly inside the analyzer is probably bad. Call Cirris to replace it.

Problem: Characters missing in printout.

Possible Causes:

- Bad printer cable.
- Printer cable is too long.
- Printer is incompatible with the analyzer.
- Microprocessor assembly inside the analyzer is bad.

Things to do:

1. Verify that the printer cable is correctly built. Check for shorts in pin 11.

2. If the printer cable is more than 10 feet long, you may have printing problems. The electrical signals from the printer become too weak to work well as the cable gets longer. Use a shorter printer cable.

3. Try using the printer cable with a PC. If it works, the printer probably is not compatible with the analyzer.

4. If the cable and printer work with a PC, the analyzer's microprocessor assembly is probably bad. Call Cirris to replace it.

Problem: Wrong characters in printout.

Possible Causes:

- Bad printer cable.
- Bad printer.
- Printer cable too long.
- Microprocessor assembly inside the analyzer is bad.

Things to do:

1. The printer cable may be bad. Check for shorts, opens, or miswires on pins 2 through 9. Either fix the cable, or replace it with a good cable.

2. The printer may be bad. Try using another printer with the analyzer, or test your original printer cable and printer with a PC. If the printer does not work with a PC, the printer is bad. Replace the printer. If the printer and cable do work with a PC, the analyzer's microprocessor assembly is probably bad.

3. The printer cable may be too long. Your printer cable should not be longer than 10 feet. The printer signals get too weak to work properly if the cable is longer than 10 feet.

4. If you have another Cirris 1000H+ analyzer available, it is possible to exchange microprocessor assemblies. If using a different microprocessor assembly solves the problem, the original microprocessor is bad. Call Cirris to replace it.

Section 13: Specifications

Test Point Capacity	128 points expandable to 256, 384, or 512 points.
Test Levels	5 VDC @ 6mA max. current.
Connection resistance sentisivity	0.1 to 100Kohms ± 4% ± 0.1 ohm, also 500K, 1M, and 5Mohms ± 20%.
Insulation resistance sensitivity	5M, 10M, 20M, 50M, 100M, 200MΩ ± 10%, and 500 Mohms ±20%.
Typical test rate	Tests 512 points in less than 3 seconds, 128 points in less than 0.3 seconds (speed will change with parameter selection, OR 128 points per second (typical).
Maximum points per net	50 points (100 points with auxiliary power supply).
Maximum capacitance per net	@50V 0.1 microfarad, 100 V 0.1 microfarad, 200 V 0.03 microfarad, 300 V 15 nanofarad, 400 V 7 nanofarad, 630 V 3 nanofarad, 800 V 1.5 nanofarad, 1000 V 1 nanofarad.
Humidity	Will test without error in environments with zero to 75% relative humidity. Relative humidity above 75% will affect performance.
HV energy limit	Current limited to 6ma max. for ten ms duration.
Printer output	Standard Epson/Centronics-type parallel interface. Pinout matches IBM PC parallel port.
Probe	For test point identification.
Memory	Nonvolatile storage for up to 50 wirelists. Lithium battery backup.
Power	105-135 VAC, 60Hz 16 Watts (210-260 VAC 50Hz optional).
Size	Main unit: 13”w X 6.5” d X 5” h./33 X 16.5 X 13 cm. Expansion box: 6” w X 6.5” d X 5” high/15 x 16.5 x 13 cm.
Weight	Main unit: 9 lbs. (4 kgs.) Expansion box: 5 lbs. (2.3 kgs.)
Display	2-line x 16-character LCD
Warranty	1 year parts and labor. Replacement modules available next working day.

Section 14: Statement of Warranty

Cirris Systems Corporation warrants the 1000H+ Cable Analyzer to be free of defects in materials and workmanship for a period of one (1) year from the date of delivery to you, as evidenced by receipt of your warranty registration form. In the event a defect develops due to normal use during the warranty period, Cirris Systems will repair or replace the analyzer with a new or reconditioned unit of equal value. For this warranty to be valid you must complete and return the warranty registration card.

In the event of replacement with a new or reconditioned model, the replacement unit will continue the warranty period of the original analyzer. Replacement units will be returned by the same method shipped; generally within one (1) working day.

If analyzer failure results from accident, abuse, or misapplication, Cirris Systems Corporation shall have no responsibility to replace the analyzer or refund the purchase price. Defects arising from such causes will be considered a breach of this warranty. Cirris Systems Corporation is not responsible for special, incidental, or consequential damages resulting from any breach of warranty, or under any other legal theory, including lost profits, downtime, goodwill, damage to or replacement of equipment and property, and any costs of recovering materials used with the Cirris 1000H+ Analyzer.

ANY IMPLIED WARRANTIES ARISING OUT OF SALES OF THE 1000H+ ANALYZER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO THE ABOVE STATED ONE (1) YEAR PERIOD. Cirris Systems SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE, EXPENSES, OR ECONOMIC LOSS.

Some states do not allow limitations on length, or implied warranty, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Cirris Systems Corporation
Salt Lake City, Utah.

PLEASE RECORD PURCHASE DATE AND SERIAL NUMBER BELOW.

DATE:________________________________
SERIAL NUMBER: ____________________

Section 15: Glossary

cable signature — A six-character alphanumeric code that changes with any change in interconnections. Valid characters include the numbers 0 through 9, and the letters A through F.

connection resistance — Option setting that allows you to select the maximum allowable resistance that a "good" connection can have.

connector adapter — Connector adapters are adapters mounted on small printed circuit boards, that allow you to connect the cables you want to test to the 1000H+. There are three types (single-high, double-high, quad-high). Each adapter has its own unique adapter signature. Adapters are usually kept organized in a 3 x 5-inch card file. You identify the adapter by its signature, either on the cardboard sleeve in which the adapter is shipped, or by the signature printed on the label on the adapter itself. Adapters are identified by the connector they mate to, not the connector mounted on the adapter.

connector adapter position — The location either on the analyzer's main unit, or on an expansion box where connector adapters are mounted. The main unit has four such positions, marked as J1, J2, J3, J4. Each expansion box also has four connector adapter positions.

control — The regulation of manufacturing or assembly processes; particularly the use of a cable signature for verifying the test setup against the documentation.

cable documentation — The written definition of how a cable should be constructed. Usually consists of a wirelist, and a complete set of notes on what connectors, materials, and special techniques should be used to build the cable successfully.

hipot — *Hipot* stands for HIgh POTential. Hipot tests are done to verify that the resistance between pins that are not supposed to be connected is sufficiently high. Generally used to check the effectiveness of insulation and/or spacing between conductors in a cable.

hipot duration — The length of time for which hipot voltage is applied to each net during hipot testing.

Insulation Resistance — Option setting that allows you to select the minimum allowable resistance between points that should not be connected.

insulation short — An *insulation short* occurs when the resistance of a connection is higher than the Connection Resistance setting, and lower than the Insulation Resistance setting. In other words, the connection has a resistance too high for the analyzer to see it as a "good" connection, and too low for the analyzer to see it as effective insulation.

interconnection — A situation where continuity exists between two connector pins. Continuity most commonly exists here because a wire connects the two pins.

intermittent The 1000H+ detects an *intermittent* fault when a cable is seen to develop shorts, opens, or excessive resistance after it has already tested as good.

known-good cable A known-good cable is a cable that you know is built correctly. We most often refer to such a cable as a *Sample Cable*. You can program the 1000H+ to test cables which are supposed to be like the Sample Cable by letting the analyzer learn the Sample Cable. When the list of interconnections and the other properties of a cable you are testing are not the same as those of the Sample Cable, the signature of the cable you are testing will not match the signature of the Sample Cable. This signature mismatch will be reported as a “bad” cable.

last test setup The last wirelist (including all test parameters and adapter information) learned by the analyzer. This can be loaded into the analyzer for testing either by learning a Sample Cable, or by retrieving the wirelist information for a cable from the analyzer’s memory.

memory location The 1000H+ has one “last learned” memory location, and as many as 50 “permanent” memory locations. The number of available locations depends upon the size of the wirelists being stored. Large wirelists take up more memory space than small ones do. You can load cable information into the analyzer for testing by retrieving the information from one of these memory locations. It is also possible to delete old wirelist information from specific memory locations to free up memory for storing new cable information.

microprocessor The electronic assembly which includes the LCD display. As you look at the analyzer from above, the microprocessor assembly is located to the left.

miswire A type of interconnection error where a one pin is incorrectly connected to another pin. For example, if a connection is supposed to exist between pins 5 and 6, but actually exists between pins 5 and 7, the error will be reported as a miswire.

net Any group of pins which are connected together. The analyzer automatically assigns a number to each group of interconnected pins (called *nets*). This number appears on the left-hand side of printed documentation, and in the left-hand side of the analyzer’s LCD display.

open A kind of interconnection error where there is no continuity between two connector pins which are supposed to be connected. A connection which the cable’s master documentation says should exist, does *not* in fact exist in the cable.

parameter signature When it displays signatures, the analyzer displays a six-digit alphanumeric *cable signature* followed by a hyphen. After the hyphen, the analyzer displays a five-digit alphanumeric known as the ***parameter*** *signature*. The parameter signature represents the various test options you have selected for your test setup. Two different kinds of cables will always have different cable signatures; but they may have the same parameter signature if the option settings for both types were identical.

pin An electrical contact point within a connector. In this manual, the word “pin” is used in place of terms such as “point,” “contact,” “socket,” “termination,” etc.

Sample Cable A *Sample Cable* is a cable you know is built correctly according to your master build list.

scanner assembly If you look at the analyzer from above, the scanner assembly is located on the right-hand side of the unit's top. This assembly contains the "J" positions onto which you install your connector adapters. It also contains the electronics which control continuity testing between all connector pins in all possible combinations.

setup The steps involved in preparing the analyzer to test cables.

short A kind of interconnection error where there is continuity between two points that are not supposed to be connected. A connection is present that does not appear in the master cable documentation.

Section 16: Blank Forms to Photocopy

What are these for?

We have designed three forms that we believe will help you document the cables you test. They are:

- **Master Parts List:** This form will help you keep track of cables by their part numbers and cable signatures.
- **Directory of Wirelists Stored in Analyzer's Memory:** This form allows you to easily write down which cable's information is stored in each of the analyzer's permanent memory locations. Remember that there are a maximum of 50 memory positions available, and that the number of positions actually available depends on the size of the wire-list you are storing. Large wirelists take up more memory than small ones do.
- **Cable Documentation Form:** This form lets you keep track of signatures, option settings, and net lists for each cable you test.

PHOTOCOPY THESE!

You should photocopy these forms instead of writing directly on them. That way you'll have a fresh supply of blank forms whenever you need them.

Master Parts List

Cable Part Number	Description	Signature

Directory of Wirelists Stored in Analyzer's Memory

Memory Location	Cable Description	Signature
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
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47		
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49		
50		

Cable Documentation Form

Memory Location #:____________

Cirris Analyzer Model:____________

Cable Signature:_______________
(first six characters)

Parameter Signature:____________
(last five characters)

Cable Description:____
____

Adapter Signatures for:

Main unit	**1st Expansion Box**	**2nd Expansion Box**	**3rd Expansion Box**
J1___________	J5___________	J9 __________	J13__________
J2___________	J6__________	J10__________	J14__________
J3___________	J7__________	J11__________	J15__________
J4___________	J8__________	J12__________	J16__________

Notes:

Note: All of these options may not appear in your particular type of analyzer.

Create Test From ___________________
Connection Resistance ___________________
Hipot Voltage ___________________
Insulation Resistance ___________________
Hipot Duration ___________________
Apply Hipot To ___________________
Single Net Error ___________________
Auto Hipot ___________________
Error Tones Are ___________________
Sorted Wire List is ___________________
Count All Cables is ___________________
Auto Print is ___________________

Net Number	Common Interconnections
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

List continues on back

Net Number	Common Interconnections
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
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Use additional page if necessary

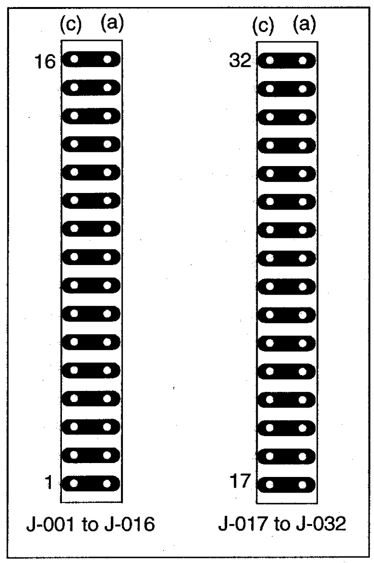
Appendix 1: Four-Wire Testing on the 1000H+

Capability and Tolerances

The 1000H+ can measure resistances from 0.010 ohms to 10 ohms with a tolerance of 4% or 5 milliohms (whichever is greater). The 1000H+ can make **relative** measurements down to 1 milliohms (0.001 ohms).

Adapters

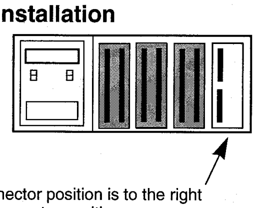
To do four-wire testing on your 1000H+, you'll need the appropriate adapters (Cirris adapter signature FBEA7D) as shown here.



Installing Four-Wire Adapters

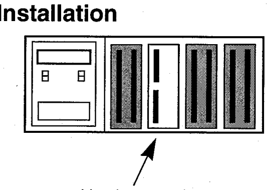
These are continuous-count adapters. You **must** install them in the analyzer starting at scanner position J1, so that all empty scanner positions are to the right of the slots already in use.

Correct Installation



Unused connector position is to the right of all used connector positions

Wrong Installation



Unused connector position is *not* to the right of all unused connector positions

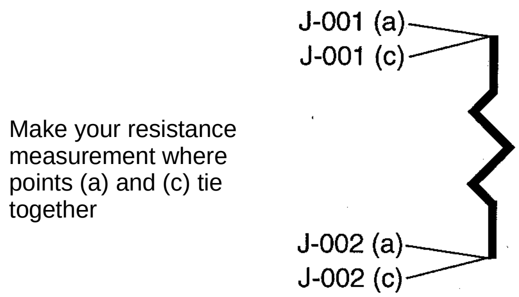
Things you must remember!

- Because these are four-wire type adapters, you must **not** use them in conjunction with other adapter types.

- All of the pins you use for testing **must** be four-wire terminated. Any pins that you don't use can be left unterminated, but only if they come *after* all terminated pins. A good rule of thumb is to four-wire terminate all unused adapter pins. You'll get "fixture open" errors if you don't follow this rule. **Note**: Four-wire termination is where the two adapter pins related to a single test point are tied together.

Tie adapter pins together correctly

You must be sure that both adapter pins which relate to a single test point are tied together at the point where you want to make your resistance measurements as shown below.



Remember these things:

- For four-wire testing to work, the total resistance from one test point to another (including the resistance of the fixturing and the cable being tested) must **not** exceed 10 ohms! Typically, fixturing with wires less than two meters (about six feet) long has less than 0.5 ohms total resistance. If the fixturing and cable resistance is less than 10 ohms, four-wire testing will "null out" the fixturing resistance.

- Your resistance measurement begins at the point where the two fixture wires connect together. They must be connected as close to the actual test point as possible. You might tie them together on your harness board right at the test connector, for example.

Testing

With your fixturing set up correctly, and a Sample Cable (a cable you're certain is built correctly) installed on your analyzer:

1. Hold down Display/Print, and turn on the analyzer.

2. Set the Connection Resistance and Insulation Resistance options to the values you want to use. (Connection Resistance will be displayed in numbers down to 1 milliohm whenever four-wire adapters are installed on the analyzer.

3. Begin testing the cable. The analyzer will automatically learn the connection pattern in the cable, and check your fixturing setup.

   - While the analyzer is in the test sequence, press Function to perform the four-wire test. If the Hipot option is on, the analyzer will hipot test the cable immediately after the four-wire test has been successfully com-

pleted. If the Auto Hipot function is turned on, the cable will automatically be four-wire tested, then hipot tested.

- Before and after a four-wire test, the cable is tested for proper continuity. A continuous low-current connection resistance test is performed to a level 100 milliohms above the four-wire connection threshold.

- The analyzer checks your fixturing continuously. Using the connections test, it constantly checks for the presence of intermittent short circuits, and fixture wires that should be connected together.

- Immediately prior to performing each high-current measurement, the resistance is measured using low current. High current is then applied based on that two-wire resistance measurement (if the two-wire resistance is less than 10 ohms). This prevents the analyzer from applying high current that could damage a contact while a cable is being connected.

The value of four-wire testing

Simply stated, a four-wire test is a test for wires and contact points. The advantage of four-wire testing over ordinary two-wire resistance testing is that four-wire testing “nulls out” the resistance of the test fixturing. Only the resistance of the wire and the contact itself is measured.

How four-wire testing works

In four-wire testing, a known amount of electrical current flows from point J-001 to point J-002. To “null out” the resistance of the test fixturing, **two** wires are connected to **each** test point. One of these wires provides a known amount of current flowing into (“sourced into”) point J-001.

A second wire is connected to point J-002. It provides a return (“sink”) path for the current flowing into J-001.

The other two wires (one to point J-001, the other to point J-002) work much like the probes on a voltmeter to measure voltage. The voltage drop across the two test points (J-001 and J-002) is measured. The resistance is then automatically calculated from the voltage drop reading using Ohm’s Law. The result is the four-wire resistance measurement.

Limitations of four-wire testing

The accuracy of the analyzer limits the effective range of four-wire testing. A tester is less accurate when it tests cables which have over ten ohms of resistance, than it is if the fixturing resistance is “nulled out” using the four-wire testing technique.

Four-wire testing may satisfy a testing specification. It offers no advantage for quality assurance testing of cables which have more than 10 ohms of resistance.

Four-wire testing does not eliminate problems caused by the resistance of test connectors. Connectors wear a bit with each insertion cycle. This wear creates resistance on the test connector, which four-wire testing does **not** “null out.” To be certain that your tests remain accurate, you must maintain the analyzer’s connectors carefully, or build special four-wire test connectors which use spring-loaded contacts. These contacts wear less with each insertion cycle than traditional connectors do.

Using Cirris Test Language (CTL) Commands

You can use Cirris Test Language (CTL) while you're doing four-wire testing. We'll discuss some of the details here.

RESIS()

RESIS() will perform a four-wire test (if necessary) to establish a resistance value, and will check the validity of only the points being accessed.

CR_TEST()

CR_TEST() may also perform a four-wire test if the low-current connection test indicates that this has to be done to determine an accurate resistance.

CR4TEST

CR4TEST performs a continuity test followed by a four-wire test.

Specifications

These are the specifications for the 1000H+ as they relate to four-wire testing:

Range

0.010 ohm to 10 ohms starting in 1 milliohm increments. Can make relative measurements down to 1 milliohm (0.001 ohms).

Accuracy

4% tolerance or 5 milliohms, whichever is greater.

Current used

1.00 amp for fixture and connection resistance less than 1.2 ohms, 0.250 amp for fixture and connection resistance less than 10 ohms.

Low-current test

Less than 10 milliamps is used to perform a continuous test whenever a cable is connected to the 1000H+. The cable is tested using low-current four-wire techniques to a threshold of 100 milliohms above the high-current four-wire threshold to look for intermittent short circuits.

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